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Effect of apical pinching and growth retardants on seed yield parameter of okra (*Abelmoschus esculentus* (L.) Moench.) cv. GO-6

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Abstract
The investigation was undertaken at the Sagdividi Farm, Department of Seed Science and Technology, College of Agriculture, Junagadh Agricultural University, Junagadh, during *kharif* 2021 to Effect of apical pinching and growth retardants on seed yield parameter of okra (*Abelmoschus esculentus* (L.) Moench.) cv. GO-6. Among 20, 30 DAS apical pinching which reducing the plant height (cm) and increase number of branches per plant, number of leaves per plant, dry weight of fruit (g), number of fruits per plant, days to harvest, fruit girth (cm), seed yield per plant (g), days to flower initiation. Without pinching (P_0) increase the plant height at 30, 60, 90 DAS and harvest, fruit length, number of seed per fruit. To application of different concentration plant retardants tried, CCC 200 ppm [seed soaking + foliar spray (S_3)] of treatment superior result in respect of dry weight of fruit (g), seed yield per plant (g), number of fruits per plant, number of branches per plant, fruit length (cm), fruit girth (cm), number of seed per fruit. However, CCC 400 ppm exhibited more number of leaves, days to flower initiation, days to harvest and minimum plant height at seed soaking stage (S_1).

Keywords: Apical pinching, growth retardant treatment, okra, seed yield parameter

Introduction
Okra (*Abelmoschus esculentus* (L.) Moench) is an economically important an annual vegetable crop grown in tropical and subtropical parts of the world. In India, it is grown for tender fruits, which are used as vegetable. Okra is known as "Lady's finger". This vegetable is called "Bhindi" in India. Okra is member of "Malvaceae" family with 2n=8x=72 or 144 chromosome and is polypoidy in nature and genus is "*Abelmoschus*". Okra is native of South Africa and Asia.

Irrespective of growth retardant treatments, the yield and yield attributing character of seed differed significantly due to apical pinching. Among several seed production approaches, apical pinching is being commonly practiced in several crops to increase the seed yield and quality. Apical pinching is known to alter the source-sink relationship by arresting the vegetative growth and hastening the reproductive phase. It also helps in production of more pod bearing branches with luxuriant foliage thus, resulting in increased photosynthetic metabolic activity, accumulation of more photosynthates and metabolites, ultimately resulting in better seed quality with higher seed yield. Ammonium chloride commonly known as Chloromequat or Cycocel is very effective which mainly blocks the biosynthesis of gibberellins that are primarily responsible for shoot elongation (Rademacher, 2000) [3]. Application of cycocel results into reduced plant height with shorter internode and also inducing the formation of more lateral fruit-bearing branches (Pateliya *et al.*, 2014) [2]. Cycocel is known to control excessive biomass production and they produce their effects through changing the internal levels of the naturally occurring hormones, thereby, causing a modification of growth and development in the desired direction and desired extent (Sahu *et al.*, 2017) [4]. While, potassium dihydrogen phosphate helps in quick seed germination and thus results in more vegetative growth and this may be due to 'K' element being more permeable through seed coat in okra, seed soaking with potassium dihydrogen phosphate (0.5%) for 16 hours produced higher seed yield with better seed quality in okra. (Vijayakumar *et al.*, 1988) [6].

Materials and Methods

The experiment was conducted at Sagdividi farm, Department of Seed Science and Technology, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* 2021 to effect of apical pinching and growth retardants on seed yield parameter of okra (*Abelmoschus esculentus* (L.) Moench.) cv. GO-6. plant height (cm), number of leaves per plant, days to flower initiation, days to harvest, number of branches per plant, number of fruits per plant, fruit length (cm), fruit girth(cm), dry weight of fruit (g), number of seeds per fruit and seed yield per plant (g).

Results and Discussion

Apical pinching affected significantly to the seed yield parameters. The maximum plant height (107.20 cm) at harvest, fruit length and number of seeds per fruit was observed in without pinching (P_0) and numerically the minimum plant height (23.06 cm) were observed in pinching at 30 DAS (P_1). The maximum number of leaves, days to harvest, number of branches per plant and number of fruits per plant, fruit girth, dry weight of fruit (g) seed yield per plant (g) was observed in pinching at 20 DAS (P_1). Maximum days to flower initation was found in pinching at 30 DAS (P_2). The present finding was in agreement with those reported by Sajjan *et al*. (2004) [5].

Growth retardants treatment affect significantly to seed yield parameters. CCC 400 ppm (T_4) recorded significantly decreased plant height (20.90, 52.97, 99.98 and 101.69 cm) at 30, 60, 90 DAS and harvest respectively. maximum plant height found in control T_0 (26.95, 64.80, 109.31 and 110.80 cm) at 30, 60, 90 DAS and harvest respectively. Similar trend was recorded in 60 DAS, 90 DAS and harvest. CCC 400 ppm (T_6) recorded significantly higher number of leaves per plant (12.97, 17.09 and 19.01) which was on par with CCC 200 ppm (T_3) (12.04, 15.85 and 18.48) and KH_2PO_4 5000 ppm (T_9) (11.35, 13.70 and 17.79) at 30, 60 and 90 DAS. but at harvest CCC 200 ppm (T_3) retained more leaves per plant (16.06) followed by CCC 400 ppm T_6 (15.00). The least number of leaves per plant was seen in control T_0 (7.85) at 30 DAS. Days to flower initiation (51.80) and days to harvest (112.85) also were found maximum in CCC 400 ppm (T_6) followed by 200 ppm and compare to control (T_0). Number of branches per plant (3.68), number of fruits per plant (15.28), fruit length (19.21 cm), fruit girth (7.16 cm), dry weight of fruit (6.89 g), number of seeds per fruit (60.57), seed yield per plant (20.00 g) significantly higher observed in CCC 200 ppm (T_3) compare to control. Cycocel (CCC) is a growth retardant and the reduced plant height is due to inhibition of gibberellic acid biosynthetic pathway. It is also known to affect several physiological processes viz., stimulation of photosynthetic activity, protein synthesis, nitrogen uptake, flower initiation, increased leaf thickness, chlorophyll content and number of seeds per fruit. Similar result found by Vijaykumar *et al.* (1988) [6], Sajjan *et al.* (2004) [5] and Bhagure and Tambe (2015) [5].

Interaction effect between apical pinching and growth retardant was found to differ significantly for seed yield and yield attributing characters. The results on plant height showed significant difference due to interaction of apical pinching and growth retardant at 30 DAS and non-significant at 60, 90 DAS and at harvest. The P_0T_0 took highest plant height (27.00 cm) and was on par with P_1T_0 (26.95 cm), P_2T_0 (26.90 cm) at 30 DAS. While, the lowest plant height observed in P_1T_4 (20.00 cm). The number of leaves per plant showed significant difference due to interaction of apical pinching and growth retardant at 30 DAS and non-significant at 60, 90 DAS and at harvest. The P_1T_6 took more number of leaves (13.40) and was on par with P_1T_5, P_1T_4 and P_0T_6 at 30 DAS. While, minimum number of leaves observed in P_0T_0 (7.72). The results on days to flower initiation and days to harvest showed significant difference due to interaction of apical pinching and growth retardant. The P_2T_6 took more number of days (52.37) to flower initiation and days to harvest (113.93). Non-significantly maximum number of branches per plant (3.84), number of fruits per plant (15.74), fruit girth (7.25 cm), dry weight of fruit (7.10 g) seed yield per plant (25.30 g) showed significant difference due to interaction of apical pinching and growth retardant was recorded in P_1T_3. fruit length showed significant difference due to interaction of apical pinching and growth retardant. The P_0T_3 took more fruit length (20.52 cm) and was on par with P_0T_2 (20.47 cm). Non-significantly maximum number of seeds per fruit was recorded in P_0T_3 (61.57).

Table 1: Growth retardants treatment affect significantly to seed yield parameters

Characters		P	T	P×T
Plant height (cm)	30 DAS	P_0	T_0	P_0T_0; P_1T_0; P_2T_0
	60 DAS	P_0	T_0	P_0T_0
	90 DAS	P_0	T_0	P_0T_0
	Harvest	P_0	T_0	P_0T_0
Number of leaves per plant	30 DAS	P_1	T_6; T_5; T_4	P_1T_6; P_1T_5; P_1T_4; P_0T_6
	60 DAS	P_1	T_6; T_5; T_4	P_1T_6
	90 DAS	P_1	T_6; T_5; T_4	P_1T_6
	Harvest	P_1	T_3; T_2; T_1	P_1T_3
Days to flower initiation		P_2	T_6; T_4; T_5	P_2T_6; P_2T_4; P_2T_5; P_2T_3; P_1T_6; P_1T_4; P_1T_5; P_0T_5; P_0T_6; P_0T_4
Days to harvest		P_1	T_6; T_4; T_5	P_2T_6
Number of branches per plant		P_1	T_3; T_2; T_1	P_1T_3
Number of fruits per plant		P_1	T_3; T_2; T_1	P_1T_3
Fruit length(cm)		P_0	T_3; T_2	P_0T_3; P_0T_2
Fruit girth		P_1	T_3; T_2; T_1; T_8; T_9	P_1T_3
Dry weight of fruit(g)		P_1	T_3; T_2; T_1	P_1T_3; P_1T_1; P_1T_2; P_2T_3; P_2T_1; P_2T_2; P_0T_3
Number of seeds per fruit		P_0	T_3	P_0T_3
Seed yield per plant(g)		P_1	T_3	P_1T_3

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