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Growth and Yield of Squash Influenced by Leaf Pruning and Gibberellic Acid (GA_3)

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Authors' contributions

This work was carried out in collaboration among all authors. Author TB conducted the experiments, collected the data and writing the manuscript. Author JU supervise the experimental works and edit the manuscript. Author BD performed statistical analysis. Authors AA and SC hypothesized the paper concept and designed the experiment. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was conducted at Sher-e-Bangla Agricultural University's Horticulture Farm, Sher-e-Bangla Nagar, Dhaka-1207, to determine the effect of pruning and GA3 on squash growth and yield over the period from November 2017 to February 2018 Three levels of pruning as P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves) and P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) and four levels of GA_3foliar application as G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G2 = 200 ppm GA_3 and G3 = 400 ppm GA_3 considered for the present study. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Considering growth parameters, pruning treatment had a significant effect on growth, yield contributing parameters and yield of squash except for stem base diameter and individual fruit weight. Regarding GA_3 treatments, growth and yield parameters were significantly influenced except fruit diameter. In terms of the combined effect of pruning and GA_3 treatments, all the studied growth and yield parameters were significantly influenced. The highest stem length (64.73 cm), number of leaves plant^{-1} (23.59), stem base diameter (2.09 cm), number of male flower plant^{-1} (8.69), number of female flower plant^{-1} (7.52), total number of fruits plant^{-1} (5.74), fruit length (22.42 cm), fruit

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diameter (6.15 cm), individual fruit weight (507.66 g), dry weight of fruit (6.61%), weight of fruits plant^{-1} (2914.33 g) and fruit yield ha^{-1} (29.14 t) were also found from the treatment combination of P_1G_1 compared to the other treatment combination. Hence, we can summarize that 1st pruning at 20 DAT (1st and 2nd leaves) with 100 ppm GA_3 given the maximum output in terms of yield compared to other treatments.

Keywords: Squash; pruning; gibberellic acid; growth; yield.

1. INTRODUCTION

Squash(*Cucurbita pepo* L.) is one of the most versatile and delicious foods available throughout the world and it pack a serious punch in terms of health and medicinal benefits [1]. Squash is rich in carotenoids, beta carotene (a precursor to vitamin A), lutein, zeaxanthin, protein, vitamin C, vitamin B6, fiber, magnesium, potassium. Squash has been used in some cultures as a medicinal plant to treat diabetes, high blood pressure, cancer, high cholesterol, and inflammation [2].

To increase the production of squash, various improved production technologies can be initiated. Pruning treatment and GA_3 application can be considered as important improved technologies for successful squash production. There is an imperative need for improvement of fruit quality to meet the change in market demand and making it available to the maximum extent by foliar spray of GA_3 and regular current season shoot pruning.

Pruning is one of the management practices for squash cultivation that increases the quantity of marketable yield harvested in the first cut, indicating that fruit maturity was also advanced [3]. It is a horticultural and silvicultural practice involving the selective removal of certain parts of the plant, such as leaves, branches, buds, or roots. It helps both harvesting and increasing the yield or quality of flowers and fruits. Its large leaves can quickly take up space in the garden and prevent fruits from receiving adequate sunlight. Pruning of squash can help alleviate any overcrowding or shading issues.

Gibberellins (GAs) are a large group of important diterpenoid acids among commercial phytohormones [4]. Gibberellins are tetracyclic diterpenoid acids that are involved in a number of developmental and physiological processes in plants [5]. These processes include seed germination, seedling emergence, stem and leaf growth, floral induction and flower and fruit growth [6]. Gibberellins (GA_3) have been used in increasing stalk length and vegetative growth, flower initiation, increasing fruit size, hastening maturity and improving fruit quality in many crops. Gibberellins play an important role in enhancing the growth and flowering in fenugreek [7]. With all of this in mind, we studied the effects of leaf pruning and GA_3 on growth and yield of squash.

2. MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted during the period from November 2017 to February 2018 at the Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, to study the impact of pruning and GA_3 on squash growth and yield. At 90 ° 22' E longitude and 23 ° 41' N latitude at an altitude of 8.2 m above sea level, the experimental area was located. It was in the Madhupur Agro-Ecological Zone (AEZ No.28) with deep red-brown terrace soil, which belongs to the Nodda cultivated series. With a particle density of 2.65 (g•ccG-1) and a bulk density of 1.52 (g•ccG-1), the soil was sandy loam in texture. The pH of the soil was 6.43; organic matter 0.84(percent); overall N 0.46(percent); exchangeable K 0.41 (meq/100 g soil); available P 18.65, S 20.92, Fe 225, Zn 4.55, and Mg 0.81(mg•g–1). Under the subtropical monsoon climate, this is characterized by scanty rainfall during the Rabi season (November to February).

2.2 Planting Materials, Experimental Design, and Treatments

The experiment was performed in Randomized Complete Block Design (RCBD) with three replications consisting of two factors: factor A, three levels of leaf pruning (P_0 = No pruning (control), P_1 = 1st pruning at 20 Days After Transplanting(1st and 2nd leaves), and P_2 = 2nd pruning at 30 Days After Transplanting (3rd and 4th leaves) and factor B, four levels of Gibberellins foliar application (G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3,

and G_3 = 400 ppm GA_3). In addition, P_0G_0, P_0G_1, P_0G_2, P_0G_3, P_1G_0, P_1G_1, P_1G_2, P_1G_3, P_2G_0, P_2G_1, P_2G_2, and P_2G_3 were the treatment combinations. Experimental plot size was 1m x 1m and plant spacing was maintained 0.5m x 0.5m.

2.3 Seeds Sowing, Pit Preparation, and Transplanting of Seedlings

Healthy and standardized 18-day-old seedlings were taken separately from the seedbed and transplanted on 25 November 2017 into the experimental site. For transplanting, plant spacing of 50 cm × 50 cm was maintained. Before uprooting the seedlings, the seedbed was watered to minimize the damage to the roots.

2.4 Pruning and GA_3 Application

The experiment was designed to spread a combination of pruning and various levels of GA_3. The plants use four levels of GA_3. According to the treatment, pruning was conducted. Primary pruning was completed at 20 days after transplanting by removing the first branch (1st and 2nd leaf) and secondary pruning was completed at 30 days after transplanting by removing the second branch (3rd and 4th leaf).

2.5 Data Collection

Growth parameters such as stem length (cm), number of leaves plant^{-1}, stem base diameter (cm), number of male flowers, number of female flowers, the total number of fruit plot^{-1}, fruit length (cm), fruit diameter (cm), Individual fruit weight (g), % fruit dry weight, number of fruits plant^{-1} and fruit yield (t/ha) were measured following the standard procedure [8].

2.6 Statistical Analysis

The data obtained for various characters was statistically evaluated using the SPSS programming software application to observe the significant variations between the treatments. The mean values of all the characters were computed and analysis of variance has been performed.

3. RESULTS AND DISCUSSION

3.1 Effects of Pruning on Growth Parameters

Growth parameters were influenced significantly by the introduction of pruning. With P_1 (1st pruning at 20 DAT) treatment, the highest stem length (62.74 cm at harvest) (Fig.1), number of leaves plant^{-1} (21.85 at harvest) (Fig. 2), and stem base diameter (1.99 cm at harvest) (Fig.3) were recorded. The shortest length of the stem was 60.23 cm and the stem diameter was 1.94 cm for P_0 care (no pruning).

Pruning tends to generate a healthier condition of the plant; sunlight enters the entire plants more effectively, enhancing light interception for photosynthesis. We found that at the early growth stage of 40 d after transplanting, the stem length and diameter of squash were greatest with pruning techniques. [9]

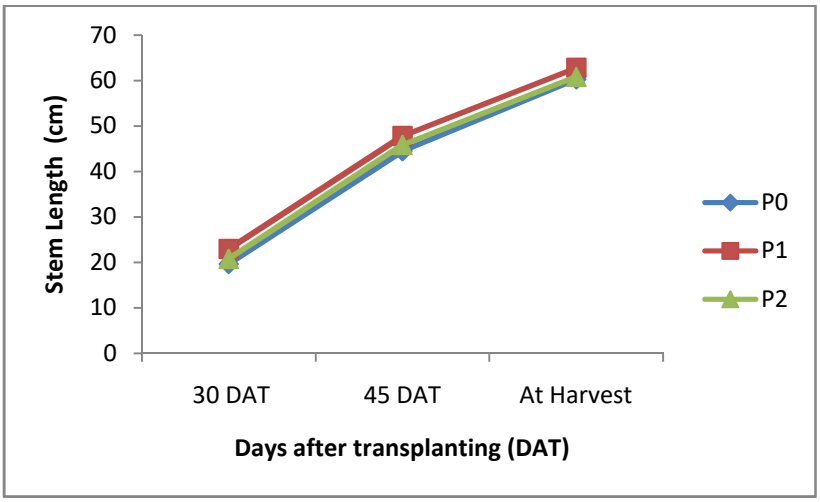

Fig. 1. Stem Length (cm) of squash influenced by pruning

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves)

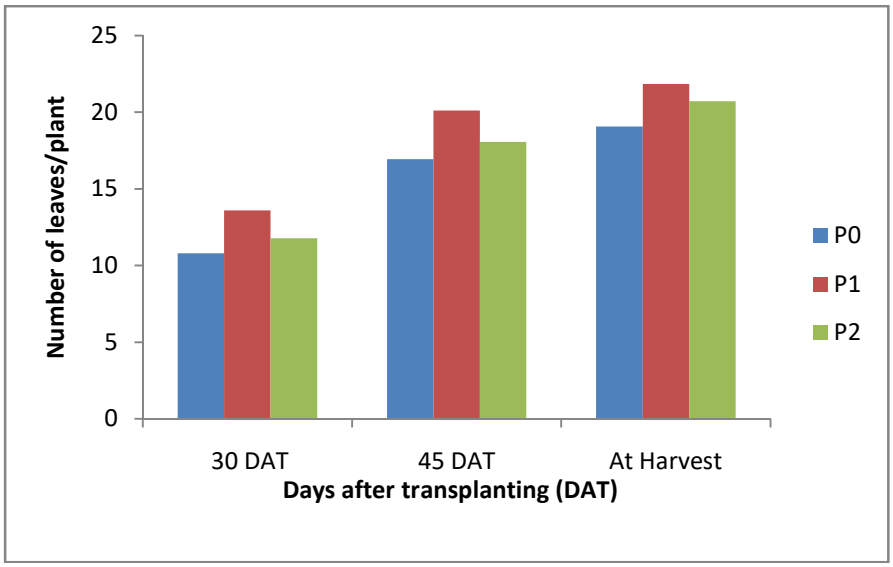

Fig. 2. Number of leaves plant^{-1} of squash influenced by pruning

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves)

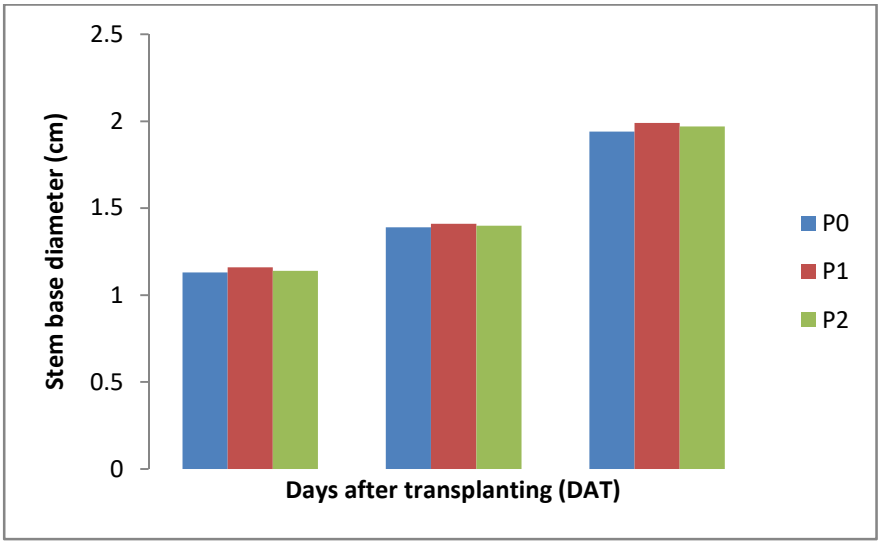

Fig. 3. Stem base Diameter (cm) of squash influenced by pruning

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves)

The availability of light and CO_2 increases the photosynthesis rate in plants, and non-pruned plants display extreme vegetative growth, causing suboptimal use of photosynthesis and resulting in decreases of plant yield [3]. Stem pruning is expected to create optimal space for the vegetative growth, which helps promotephotosynthesis, resulting in cell enlargementinfruit length and diameter [10, 11].Pruning helps reduceunproductiveplant parts, which allow thephotosynthesisprocess to be more widelyallocated,enhancingfruit weight and production [12,13].

We also observed that yield-contributing parameters were significantly improved by proper pruning. Compared to no pruning, we observed increased flowering, fruit number per plant, fruit length and diameter, and eventually increased yield. With regard to fruit setting, fruits per plant, and ultimate yield with early-stage stem pruning in bell pepper, [1] described a similar finding.

3.2 Effects of GA_3 Application on Growth Parameters

In addition, at different growth stages, stem length was greatly influenced by various GA_3 levels. However, the results on growth parameters like stem length (63.31 cm at harvest) (Fig.4), number of leaves plant^{-1} (21.77 at harvest) (Fig.5), and stem base diameter (2.05 cm at harvest) (Fig.6) were found from the treatment G_1 (100 ppm GA_3) compared with the control treatment. Gibberellins (GAs) are a large group among commercial phytohormones of essential diterpenoid acids. Gibberellins are tetracyclic diterpenoid acids involved in a number of plant developmental and physiological processes [4]. These processes include germination of seeds, emergence of seedlings, growth of stems and leaves, floral induction and growth of flowers and fruits [6, 14].

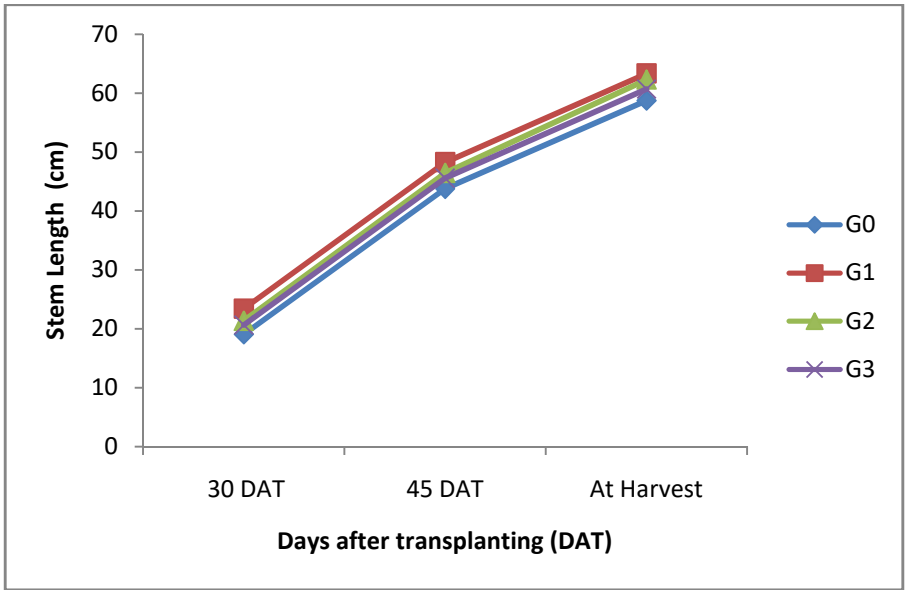

Fig. 4. Stem Length (cm) of squash influenced by GA_3
G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

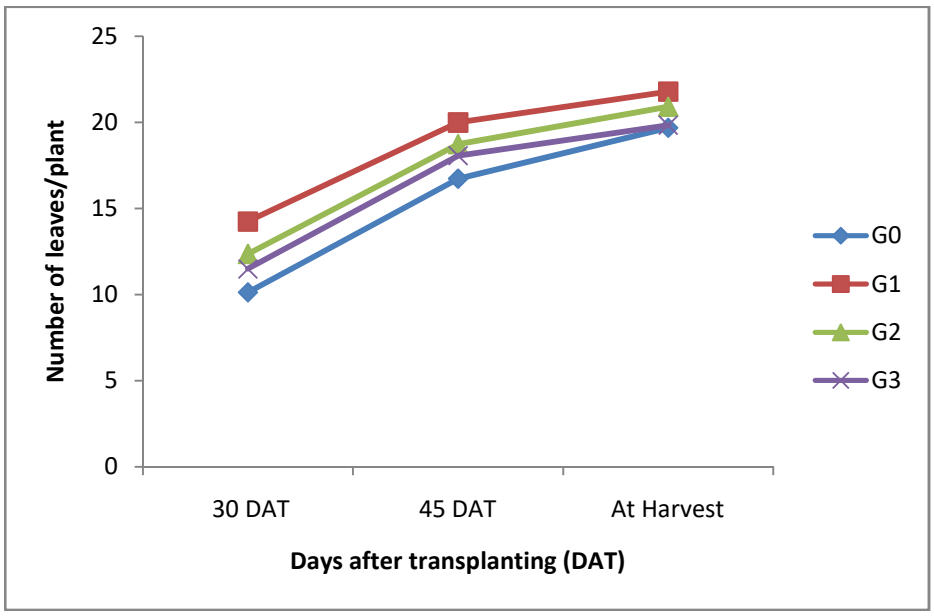

Fig. 5. Number of leaves plant^{-1} of squash influenced by GA_3
G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

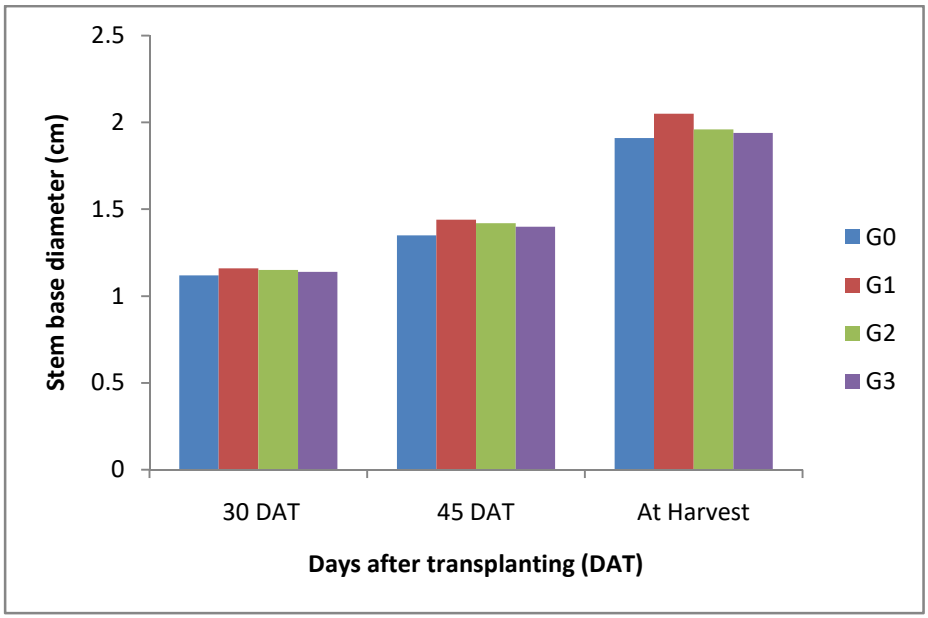

Fig. 6. Stem base Diameter (cm) of squash influenced by GA_3
G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Gibberellins are also involved in promoting root development, abundance of root hair and inhibition of differentiation of floral buds in woody angiosperms, regulating dormancy of vegetative and reproductive buds and delaying senescence in many organs of a variety of plant species [15,16]. Gibberellic acid is such a plant growth regulator that a number of growth and development phenomena in various plants can be manipulated. GA_3 promotes plant growth activities, enhances stem elongation and increases dry weight and yield [5].

In many crops, gibberellins (GA_3) have been used to increase stalk length and vegetative development, flower initiation, increase fruit size, accelerate maturity and improve fruit quality. Gibberellins play a significant role in the improvement of fenugreek growth and flowering [9]. Exogenous growth regulator treatments – gibberellins (usually gibberellic acid; GA_3) have been shown to break dormancy in many seed species [7, 17].

3.3 Effects on Growth Parameters by the Combined Impact of Pruning and GA_3 Application

Differences in stem length and diameter were statistically significant in the combined impact of pruning and GA_3. Compared to other treatments, the highest stem length (64.73 cm at harvest) (Table 1), number of leaves plant^{-1} (23.59) (Table 2), stem base diameter (2.09 cm at harvest) (Table 3) was found from the treatment combination of P_1G_1. On the other hand, the lowest stem length (57.22 cm) (Table 1), number of leaves plant^{-1} (17.26) (Table 2), stem base diameter (1.90 cm) (Table 3), were found from the treatment combination of P_0G_0.

3.4 Yield Attributes Influenced by Pruning

Yield contributing parameters in squash were significantly influenced by pruning. The highest number of male flower plant^{-1} (7.39), number of female flower plant^{-1} (6.17), total number of fruits plant^{-1} (4.95) (Table 4), fruit length (21.18 cm), fruit diameter (5.83 cm), individual fruit weight (419.60 g) (Table 5), % fruit dry weight (6.09%), weight of fruits plant^{-1} (2114.38 g) and fruit yield ha^{-1}(21.14 t) (Table 6) were also found from the treatment P_1 (1st pruning at 20 DAT). Similarly, the lowest stem length (60.23 cm at harvest), number of leaves plant^{-1} (19.07 at harvest) and stem base diameter (1.94 cm and at harvest) were found from the control treatment P_0 (no pruning). The lowest number of male flower plant^{-1} (4.99), number of female flower plant^{-1} (4.69), total number of fruits plant^{-1} (4.27) (Table 4), fruit length (20.16 cm), fruit diameter (3.83 cm), individual fruit weight (371.00 g) (Table 5), % fruit dry weight (5.80%), weight of fruits plant^{-1} (1605.59 g) and fruit yield ha^{-1}(16.05 t) (Table 6) were also found from the control treatment P_0 (no pruning).

.**Table 1. Stem Length (cm) of squash influenced by the combined effect of pruning and GA_3**

Treatments Combination	Stem Length (cm)		
	At 30 DAT	At 45 DAT	At Harvest
P_0G_0	17.88 h	42.27 j	57.22 h
P_0G_1	21.69 c	46.62 d	61.74 e
P_0G_2	19.70efg	44.66 g	61.27 cd
P_0G_3	19.36 fg	44.24 h	60.72 de
P_1G_0	20.47de	45.22 f	60.24 ef
P_1G_1	25.28 a	49.73 a	64.73 a
P_1G_2	23.43 b	48.45 b	64.35 a
P_1G_3	22.67 b	47.76 c	61.65 c
P_2G_0	18.88 g	43.81 i	58.71 g
P_2G_1	23.24 b	48.46 b	63.45 b
P_2G_2	21.02 cd	46.26 e	61.24 cd
P_2G_3	19.86 ef	44.69 g	59.74 f
Standard Error(±)	1.76	2.52	3.11
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Table 2. Number of leaves plant^{-1} of squash influenced by combined effect of pruning and GA_3

Treatments Combination	No. of Leaves		
	At 30 DAT	At 45 DAT	At Harvest
P_0G_0	9.31 j	15.24 f	17.26 h
P_0G_1	12.67 e	18.79 d	20.58 de
P_0G_2	10.86 g	17.11 e	19.43 fg
P_0G_3	10.38 h	16.63 e	19.02 g
P_1G_0	11.33 f	18.23 d	19.96 ef
P_1G_1	15.75 a	21.27 a	23.59 a
P_1G_2	13.92 c	20.35 bc	22.57 b
P_1G_3	13.38 d	20.65 ab	21.28 cd
P_2G_0	9.766 i	16.74 e	21.83 c
P_2G_1	14.37 b	19.88 c	21.15 cd
P_2G_2	12.26 e	18.73 d	20.69 de
P_2G_3	10.72 gh	16.89 e	19.17 g
Standard Error (±)	1.36	1.52	2.11
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

3.5 Yield Attributes Influenced by GA_3 Application

Yield contributing characteristics of squash were also significantly influenced by GA_3. The highest number of male flower plant^{-1} (7.26), number of female flower plant^{-1} (6.48), total number of fruits plant^{-1} (5.37) (Table 4), fruit length (22.15 cm), fruit diameter (5.41 cm), individual fruit weight (455.50 g) (Table 5), % fruit dry weight (6.50%), weight of fruits plant^{-1} (2451.21 g) and fruit yield ha^{-1}(24.51 t) (Table 6) was found from the treatment G_1 (100 ppm GA_3). The lowest stem length (58.72 cm at harvest), number of leaves plant^{-1} (19.68 at harvest), stem base diameter (1.91 cm at harvest), number of male flower plant^{-1} (4.25), number of female flower plant^{-1} (4.20) (Table 4), total number of fruits plant^{-1} (3.85), fruit length (19.15 cm), fruit diameter(4.44 cm), individual fruit weight (375.13 g) (Table 5), % fruit dry weight (5.29%), weight of fruits plant^{-1} (141.50 g) and fruit yield ha^{-1}(14.41 t) (Table 6) were found from the control treatment G_0 (0 ppm GA_3).

Table 3. Stem base Diameter (cm) of squash influenced by the combined effect of pruning and GA_3

Treatments Combination	Stem base Diameter (cm)		
	At 30 DAT	At 45 DAT	At Harvest
P_0G_0	1.11 d	1.35 e	1.90 e
P_0G_1	1.15 bc	1.45 ab	1.97 bc
P_0G_2	1.15 bc	1.42 abc	1.96 bcd
P_0G_3	1.15 bc	1.42 abc	1.94 cde
P_1G_0	1.13 cd	1.36 de	1.93 de
P_1G_1	1.18 a	1.45 a	2.09 a
P_1G_2	1.16 ab	1.43 ab	1.98 b
P_1G_3	1.15 b	1.41 bc	1.96 bcd
P_2G_0	1.12 d	1.35 de	1.91 e
P_2G_1	1.15 b	1.41 bc	2.08 a
P_2G_2	1.15 b	1.41 bc	1.95 bcd
P_2G_3	1.13 cd	1.39 cd	1.93 de
Standard Error(±)	0.28	0.36	0.44
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Table 4. Yield contributing parameters of squash (male flower/plant, female flower/plant, and fruits/plant) influenced by pruning and GA_3

Treatments	Yield contributing parameters		
	Total No. of Male Flower/plant	Total No. of Female Flower/plant	Total No. of Fruits/plant
Effect of pruning			
P_0	4.99 b	4.69 b	4.27 b
P_1	7.39 a	6.17 a	4.95 a
P_2	5.74 b	4.90 b	4.49 ab
Standard Error (±)	0.48	0.62	0.77
Significance	0.000	0.001	0.033
GA3			
G_0	4.25 c	4.20 c	3.85 c
G_1	7.26 a	6.48 a	5.37 a
G_2	7.02 a	5.20 b	4.62 b
G_3	5.63 b	5.14 b	4.44 b
Standard Error (±)	0.58	0.74	0.68
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

3.6 Yield Attributes Influenced by the Combined Effect of Pruning and GA_3 Application

In terms of the combined effect of pruning and GA_3 treatments, all the studied growth and yield parameters were significantly influenced. the highest number of male flower plant^{-1} (8.69), number of female flower plant^{-1} (7.52), total number of fruits plant^{-1} (5.74) (Table 7), fruit length (22.42 cm), fruit diameter (6.15 cm), individual fruit weight (507.66 g) (Table 8), % fruit dry weight (6.61%), weight of fruits plant^{-1} (2914.33 g) and fruit yield ha^{-1}(29.14 t) (Table 9)were also found from the treatment combination of P_1G_1. Similarly, the lowest number of male flower plant^{-1} (3.47), number of female flower plant^{-1} (3.85), total number of fruits plant^{-1} (3.69) (Table 7), fruit length (18.83 cm), fruit diameter (3.19 cm), individual fruit weight (305.66 g) (Table 8), % fruit dry weight (5.15%), weight of fruits plant^{-1} (1130.30 g) and fruit yield ha^{-1}(11.30 t) (Table 9)were found from the treatment combination of P_0G_0.

Table 5. Yield contributing parameters of squash (fruit length, fruit diameter, individual fruit weight) influenced by pruning and GA_3

Treatments	Yield contributing parameters		
	Fruit Length (cm)	Fruit Diameter (cm)	Individual Fruit Weight (g)
Effect of pruning			
P_0	20.16 a	3.83 c	371.00 a
P_1	21.18 a	5.83 a	419.60 a
P_2	20.51 a	4.79 b	405.72 a
Standard Error (±)	0.24	0.17	6.48
Significance	0.112	0.000	0.190
Effect of GA_3			
G_0	19.15 c	4.44 a	375.13 b
G_1	22.15 a	5.41 a	455.50 a
G_2	20.90 b	4.78 a	396.01 b
G_3	20.26 c	4.65 a	368.46 b
Standard Error (±)	0.41	0.22	7.33
Significance	0.000	0.186	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Table 6. Yield contributing parameters and yield of squash (percent (%) fruit dry weight, the weight of fruits plant^{-1}, fruit yield ha^{-1}) influenced by pruning and GA_3

Treatments	Yield contributing parameters and yield		
	Percent (%) fruit dry weight	Weight of fruits plant^{-1}(g)	Fruit yield ha^{-1} (t)
Effect of pruning			
P_0	5.80 a	1605.59 b	16.05 b
P_1	6.09 a	2114.38 a	21.14 a
P_2	5.85 a	1816.24 ab	18.16 ab
Standard Error (±)	0.29	7.86	1.03
Significance	0.269	0.000	0.45
Effect of GA_3			
G_0	5.29 c	1441.50 c	14.41 c
G_1	6.50 a	2451.21 a	24.51 a
G_2	6.03 b	1842.17 b	18.42 b
G_3	5.83 b	1646.72 bc	16.46 bc
Standard Error (±)	0.37	8.55	1.13
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Table 7. Yield contributing parameters of squash (male flower/plant, female flower/plant, and fruits/plant) influenced by the combined effect of pruning and GA_3

Treatments	Yield contributing parameters		
	Total No. of Male Flower/plant	Total No. of Female Flower/plant	Total No. of Fruits/plant
P_0G_0	3.47 e	3.85 e	3.69 e
P_0G_1	6.14 c	5.52 cd	4.82 b
P_0G_2	5.50 cd	4.48 de	4.17 d
P_0G_3	4.86 d	4.91 d	4.39 cd
P_1G_0	5.63 cd	4.87 d	4.19 d
P_1G_1	8.69 a	7.52 a	5.74 a
P_1G_2	8.32 a	6.18 bc	5.05 b
P_1G_3	6.92 b	6.10 bc	4.85 b
P_2G_0	3.64 e	3.88 e	3.69 e
P_2G_1	6.96 b	6.40 b	5.55 a
P_2G_2	7.26 b	4.94 d	4.65 bc
P_2G_3	5.11 d	4.41 de	4.10 de
Standard Error(±)	1.27	1.48	1.44
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Table 8. Yield contributing parameters of squash (fruit length, fruit diameter, individual fruit weight) influenced by the combined effect of pruning and GA_3

Treatments Combination	Yield contributing parameters		
	Fruit Length (cm)	Fruit Diameter (cm)	Individual Fruits Weight (g)
P_0G_0	18.83 l	3.19 e	305.66 g
P_0G_1	21.84 c	4.94 cd	447.50 abc
P_0G_2	20.12 g	3.71 e	369.33 defg
P_0G_3	19.87 h	3.49 e	361.53 defg
P_1G_0	19.45 j	5.40 bc	336.73 fg
P_1G_1	22.42 a	6.15 a	507.66 a
P_1G_2	21.61 d	5.96 ab	430.33 bcd
P_1G_3	21.23 e	5.83 ab	403.66 cdef

Treatments Combination	Yield contributing parameters		
	Fruit Length (cm)	Fruit Diameter (cm)	Individual Fruits Weight (g)
P_2G_0	19.17 k	4.73 d	483.00 ab
P_2G_1	22.19 b	5.14 cd	411.33 cde
P_2G_2	20.99 f	4.66 d	388.36 cdef
P_2G_3	19.68 i	4.64 d	340.20 efg
Standard Error(±)	0.72	0.42	12.96
Significance	0.000	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves)G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

Table 9. Yield contributing parameters and yield of squash (percent (%) fruit dry weight, the weight of fruits plant^{-1}, fruit yield ha^{-1}) influenced by the combined effect of pruning and GA_3

Treatments Combination	Yield contributing parameters and yield		
	Percent (%) fruit dry weight	Weight of fruits plant^{-1} (g)	Fruit yield ha^{-1} (t)
P_0G_0	5.15 j	1130.30 f	11.30 f
P_0G_1	6.39 c	2159.15 bc	21.59 bc
P_0G_2	5.88 g	1544.66 def	15.44 def
P_0G_3	5.77 h	1588.26 de	15.88 de
P_1G_0	5.42 j	1410.90 ef	14.10 ef
P_1G_1	6.61 a	2914.33 a	29.14 a
P_1G_2	6.24 d	2174.72 bc	21.74 bc
P_1G_3	6.09 e	1957.56 bcd	19.57 bcd
P_2G_0	5.30 k	1783.31 cde	17.83 cde
P_2G_1	6.50 b	2280.15 b	22.80 b
P_2G_2	5.98 f	1807.14 cde	18.07 cde
P_2G_3	5.65 i	1394.35 ef	13.94 ef
Standard Error(±)	0.62	13.58	1.96
Significance	0.45	0.000	0.000

P_0 = No pruning (control), P_1 = 1st pruning at 20 DAT (1st and 2nd leaves), P_2 = 2nd pruning at 30 DAT (3rd and 4th leaves) G_0 = No GA_3 (control), G_1 = 100 ppm GA_3, G_2 = 200 ppm GA_3, G_3 = 400 ppm GA_3

4. CONCLUSION

From the above results, it can be concluded that among the different treatment combination of pruning and GA_3 treatments, P_1G_1 (1^{st} pruning at 20 DAT with G_1 = 100 ppm GA_3) have significant positive effect on growth and yield of squash and resulted in highest fruit yield ha^{-1}(29.14 t) compared to all other treatment combinations.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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