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Response of Pruning Time and Intensity on Growth and Yield of Guava (*Psidium guajava* L.) CV. Shweta

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A B S T R A C T

An experiment was carried out to study the "Response of pruning time and intensity on growth and yield of guava (*Psidium guajava* L.) Cv. Shweta" in the year 2018-2019. The experiment was conducted in Randomized Block Design in a factorial arrangement having two factors on time of pruning and pruning intensity.The combination of three levels of 1st May (M_1), 1st June (M_2) and 1st July (M_3) are done and four level of pruning intensity are done at 0% pruning (P_0), 25% pruning (P_{25}), 50% pruning (P_{50}) and 75% pruning (P_{75}) are done at a time comprising twelve treatment combination. Results reveal that the maximum new shoots per pruned branch, number of flowers per tree, per cent fruit set, fruit retention, number of fruits per tree and fruit yield (kg per tree)was recorded with50% pruning (P_{50}) and Length of new shoots (cm) was recorded with 75% pruning (P_{75}).The pruning time is also influenced with increasing trend on Length of new shoots, number of flowers per tree, fruit retention, number of fruit per tree and fruit yield (kg per tree)was recorded maximum with 1st May (M_1), maximum number of new shoots per pruned branch recorded under 1st June (M_2) and maximum per cent fruit set under 1st July (M_3). However, the50% pruning of shoot in the month of May can be recommended to obtained higher yield and quality production of guava fruit in the Indo-gangetic plains of eastern Uttar Pradesh.

Introduction

Guava (*Psidium guajava* L.) is also known as "Apple of Tropics" and it is popular fruit tree of tropical and subtropical climate of India. It belongs to family Myrtaceae, diploid chromosome number is 2n=22 and its native of Peru (Tropical America).Guava is cultivated on varied types of soils like heavy clay, light sand, gravel bars or lime stone ranging from pH of 4.5-9.4. It is grown all over the tropical and subtropical region up to

1500 m above mean sea level. It is grown in both humid and dry climate. The optimum temperature ranges from 23℃ to 28℃. It grows best with annual rainfall ranges from 1000 to 2000 mm restricted between June to September. It requires dry atmosphere at the time of flowering and fruiting. High temperature at the time of fruit development causes fruit drop. The rain during harvesting period deteriorates the quality of fruits.

The tree of common guava is a small, sometimes growing to 8 or 9 meter, the trunk is slender with greenish brown scaly bark, the young branchlets are quadrangular, the leaves are oblong-elliptic, oval in outline, 7-15 cm long, acute to round at the apex, finely pubescent below, with the venation conspicuously impressed on the upper surface. White solitary flowers or several together upon a slender peduncle are produced on branchlets of recent growth and are 2.5cm broad. The calyx splits into irregular segments. In the centre of the flower is cluster of long stamen. Ovary is inferior, fruit type is berry, 2.5 to 10 cm in length, commonly yellow in colour with white flesh.

In view of area and production of guava in India is 2,70,000 ha and 4,107,000 MT (Anon. 2018-19) and productivity is 14 MT/ha (NHB Database 2016-17). India ranks first in guava production in the world followed by Pakistan and it was introduced in India in 17th century by Portuguese explores brought the fruit and many others to Goa (Menzel and Paxton 1985). At present, guava has got well established market in more than 60 countries of the world. It is cultivated in India, Algeria, Australia, Brazil, California, China, Columbia, Costa Rica, Cuba, and U.S.A etc. In India guava is widely grown in Uttar Pradesh, Madhya Pradesh, Maharashtra, Bihar, West Bengal, Gujarat, Andhra Pradesh, Punjab, Tamil Nadu, Karnataka and Assam. The best quality guavas are produced in Uttar Pradesh. The district of Allahabad has a reputation of growing best guava in the country as well as in the world.

Guava is considered to be one of the exquisite, nutritionally valuable and remunerative fruit crop. It excels among most other fruit crops in productivity, hardiness, adaptability and nutritive value. Guava is rich source of vitamin C 200-300 mg/100g, 0.33 per cent acidity, 4.46 per cent reducing sugar, 7.87 per cent total sugar, 1.11 per cent starch, 1.15 per cent Pectin, 13.29 per cent total soluble solid, Besides this, guava fruit is also good source of minerals like phosphorous 22.5-40mg, calcium 10-30mg and iron 0.60-1.39mg. The quality of winter season fruit is considered to be superior to rainy season fruit. Guava fruits are used for making juice, jam, jellies, toffee and candy. The leaves of guava have been used for curing of diarrhoea. Guava fruit contain antioxidant and is known to control systolic blood pressure.

Pruning is one of the oldest cultural practices which are practiced in temperate and subtropical fruit crops to bring a balance between vegetative and reproductive growth of the plant. In guava, the flowers and fruits are borne on current season growth therefore, it responds well to pruning. Terminal portion of the shoots up to 20 or 30 cm length should be pruned between 20th to 30th April. Always avoid severe pruning in guava. Pruning the current season's growth of spring flush is advocated to avoid the rainy season crop. The pruning of 25-50% shoots in April and May was found to escape flowering in rainy season and encouraged winter season flowering of Sardar guava (Dhaliwal *et al.,* 2000).

Pruning of guava is one of the most important practices that influences the vigour, productivity and quality of the fruits (Gadgil and Gadgil, 1933) pruning in summer also reduce the rainy season crop which is of poor

quality and enhance the winter crop with quality fruit.

Materials and Methods

The present investigation was under taken at Main Experimental Station, Horticulture, A.N.D.U.A.&T., Kumarganj, (Faizabad) Ayodhya U.P. India during summer season of 2018- 19. Geographically, it is situated in typical saline alkali belt of Indo- gangetic plains of eastern U.P. at 26.47 N latitude, 88.12°E longitudes and at an altitude of 113 meter from mean sea level. The region enjoys sub-humid and subtropical climate receiving a mean annual rainfall of about 1215 mm out of which about 85% is concentrated from mid June to end of September with an average annual rainfall of 764.01mm and relative humidity of 66.76 per cent.

The winter months prevails from November to March with mild to severe cool temperature ranging from 17.9 to 33.1℃. The severe cold temperature 17.9℃ was recorded in the month of January and occasionally winter rains and frost was also noticed. The summer months occur from April to June with an average temperature of 39.2 to 41.4℃. The dry and hot wind waves were also noticed in the months of mid May and June.

The experiment was laid out in Factorial Randomized Block Design with three replications in the month of May, 2018. One plant was taken as a unit and total number of plants selected is 36. The pruning are done in the different times and intensity. In according to the time of pruning is 1st May (M_1), 1st June (M_2) and 1st July (M_3) are done and pruning intensity are done at 0% pruning(P_0), 25% pruning(P_{25}), 50% pruning (P_{50}) and 75% pruning (P_{75}) are done at a time. The observations were recorded on New shoots per pruned branch, Length of new shoots (cm), Number of flower per tree, Per cent fruit set, Fruit retention, Number of fruit per tree and Fruit yield (kg per tree).Statistical analysis of the data obtained in the different sets of experiments were calculated, as suggested by Panse and Sukhatma(1989).

Results and Discussion

The statistical analysis of data (Table-1) revealed that maximum number of new shoots per pruned branch was recorded with the Pruning intensity with 50% of shoot length (5.56) which was found significantly superior over rest of the treatments. The minimum number of new shoots per pruned branch (2.78) was observed with no pruning (control).The time of pruning showed non-significant effect on number of new shoots per pruned branch, However, maximum number of new shoots per pruned branch was recorded with the pruning in June (4.42) followed by May pruning (4.17).The minimum number of new shoots per pruned branch (3.75) was recorded with pruning in July. The interaction Effect of pruning intensity and time for number of new shoots per pruned branch was found significant. The maximum number of new shoots per pruned branch was recorded with 75% pruning intensity in May (6.67) which was found at par with 50% pruned in June whereas minimum no. of new shoots (2.33) was noted in control (no pruning in May).

Length of new shoots was recorded(Table-1)the longest shoot (60.79cm) with 75% pruning, which was significantly at par with 50% pruning (58.69cm).The shortest length of new shoot (43.72 cm) was recorded with the control (no pruning). The time of pruning significantly influenced Length of shoots in guava cv. Shweta. The maximum value (59.30cm) was found with 75% pruning in May followed by 75% pruning in June(54.19) which is found significantly at par. Minimum length of new shoot (47.74 cm) was observed

with pruning in July (M_3).The length of new shoot was also found significant with pruning intensity and time of pruning whereas interaction effect of pruning intensity and pruning time was also found significant. Maximum length (72.87 cm) was recorded with the 75% pruning intensity in May. The minimum shoot length was recorded in control (no pruning in June). Shaban and Haseeb (2009) were found longer and more number of new shoots with moderate pruning.

The Number of flowers per tree was recorded(Table-1) maximum (282.33) with the pruning intensity of 50% which was found significantly superior over treatment and minimum number of flowers (113.56) were recorded with no pruning (P_0).Time of pruning was also effective in influencing the number of flowers. Significantly maximum number of flowers (214.58) was recorded with pruning in May whereas minimum value (181.25) was found with July pruning. Pruning intensity and time of pruning significantly influenced number of flowers per tree whereas interaction effect of pruning intensity and pruning time was also found significant. Maximum number of flower (352.00) was recorded with the 50% pruning intensity in May, whereas minimum number of flowers per trees (98.00) was noted in control. Singh *et al.,* (2010) reported higher number of flowers in moderately pruned branch.

These effects of pruning intensity and time may be because pruning shift the allocation of metabolites from rainy season in favour of increased vegetative growth due to flower and fruit let removal as a result of pruning. The number of flowers in new branch increases by pruning because of reduced shoot growth which inhibits apical dominance and help to develop more flowers in new shoots. Similar results were also reported by Singh *et al.,* (2001) reported pruning time significantly increases number of shoots and flowering percentage, Sulemman Mohammad *et al.,* (2006) also reported maximum shoot length, number of flowers with 60 cm pruning in rainy season. Singh (2012) also revealed that increase in severity of pruning increase in shoot length of new shoot and number of new shoots per branch.

Per cent fruit set (Table-1) the pruning intensity significantly influenced the Per cent fruit set in guava. The maximum fruit set per cent (68.72%) was noted with 50% pruning and minimum 51.27%) was observed in no pruning intensity. Time of pruning was also found effective in influencing the per cent fruit set in guava. The per cent fruit set was found significant with the time of pruning. The maximum of fruit set per cent (61.60 %) was recorded with pruning in July followed by pruning in May. The minimum value (59.00%) was found with the pruning in June. Pruning time and pruning levels significantly influenced fruit set but the interactions effect of pruning level and pruning time was found non-significant. The maximum fruit set (69.40%) was noted with 50% pruning in July, whereas minimum fruit set was noted with pruning intensity of 75% in June.

The maximum fruit retention (Table-1) was recorded (73.36%) with pruning intensity of 50% followed by pruning intensity 25 % (71.09%). The minimum fruit retention (64.59%) was noted with pruning intensity of 75%.Pruning time was also found influenced fruit retention per-cent significantly. The maximum fruit retention (71.00%) was noted with pruning in May (M_1). The minimum fruit retention 66.83 % was noted with pruning in July (M_3). Pruning time and pruning levels significantly influenced fruit retention but the interaction effect of pruning level and pruning time was found non-significant.

Table.1 Response of pruning time and intensity on growth and yield of guava (*Psidium guajava* L.) cv. Shweta

Treatment	New shoots per pruned branch	Length of new shoots (cm)	Number of flower per tree	Per cent fruit set.	Fruit retention	Number of fruit per tree.	Fruit yield (kg per tree).
$P_{0\%}$	2.78	43.72	113.56	57.51	67.51	84.53	14.36
$P_{25\%}$	2.89	51.77	178.78	63.76	71.09	140.58	30.84
$P_{50\%}$	5.56	58.69	282.33	68.72	73.36	228.56	47.60
$P_{75\%}$	5.22	60.79	202.89	51.77	64.59	143.44	30.52
SEm±	**0.220**	**2.235**	**5.884**	**0.492**	**0.436**	**4.677**	**1.094**
C.D.(P=0.05)	**0.65**	**6.56**	**17.26**	**1.45**	**1.28**	**13.72**	**3.21**
M_1	4.17	59.30	214.58	60.73	71.00	170.25	34.67
M_2	4.42	54.19	187.33	59.00	69.58	144.61	29.94
M_3	3.75	47.74	181.25	61.60	66.83	132.97	27.87
SEm±	**0.191**	**1.936**	**5.096**	**0.43**	**0.378**	**4.050**	**0.947**
C.D.(P=0.05)	**NS**	**5.67**	**14.95**	**1.249**	**1.11**	**11.88**	**2.78**
P_0 M_1	2.33	43.17	129.00	58.22	69.33	98.33	15.66
P_0 M_2	3.00	42.47	113.67	55.28	67.97	85.07	15.34
P_0 M_3	3.00	45.53	98.00	59.02	65.23	70.17	12.08
P_{25} M_1	2.67	56.50	213.67	64.43	73.00	171.67	32.92
P_{25} M_2	3.00	52.13	197.00	61.58	71.53	155.04	39.23
P_{25} M_3	3.00	46.67	125.67	65.28	68.73	95.03	20.37
P_{50} M_1	5.00	64.67	352.00	68.40	75.33	291.67	61.40
P_{50} M_2	6.67	58.53	253.33	68.37	73.83	205.67	39.99
P_{50} M_3	5.00	52.88	241.67	69.40	70.90	188.33	41.40
P_{75} M_1	6.67	72.87	163.67	51.87	66.33	119.33	28.70
P_{75} M_2	5.00	63.64	185.33	50.75	65.00	132.67	25.21
P_{75} M_3	4.00	45.87	259.67	52.70	62.43	178.33	37.65
SEm±	**0.382**	**3.871**	**10.192**	**0.851**	**0.756**	**8.101**	**1.895**
C.D.(P=0.05)	**1.12**	**11.36**	**29.89**	**NS**	**NS**	**23.76**	**5.56**

Maximum fruit retention (75.33%) was recorded with pruning intensity of 50% in May whereas minimum fruit retention was recorded with 75% pruning intensity in July.

The number of fruits per tree (Table-1) was significantly influenced by different pruning level. The maximum number of fruits per tree (228.56) was noted with pruning intensity of 50%. The minimum fruit per tree (84.53) was noted without pruning (P_0).Time of pruning was also found significant regarding fruits per tree.

Maximum number of fruits per tree (170.25) was recorded with the pruning in May (M_1) which was found significantly superior over rest of the treatments while, minimum number of fruits per tree (132.97) was recorded with pruning in July (M_3). Pruning time and pruning levels significantly influenced number of fruits per tree. The interaction effect of pruning level and pruning time was also found significant. Maximum number of fruits per tree (291.67) was counted with pruning intensity of 50% in May. The minimum number of fruits per tree was recorded with no pruning in July.

The pruning intensity significantly influenced the fruit yield per tree. Maximum fruit yield per tree (47.60kg) was recorded with pruning intensity of 50% followed by pruning intensity of 25% with yield per tree (30.84 kg) and minimum fruit yield per tree (14.36 kg) was recorded with no pruning (P_0).Pruning time significantly influenced the fruit yield per tree. The maximum fruit yield (34.67 kg) was recorded with pruning in May followed by pruning in June and minimum fruit yield per tree (27.87 kg) was noted with pruning in July. Pruning time and pruning levels significantly influenced fruit yield per tree. The interaction effect of pruning level and pruning time was also found significant (Table 4.7 and Fig. 4.7). The maximum yield per tree (61.40 kg) was recorded with pruning intensity of 50% in May and minimum fruit yield per tree was noted with no pruning in July.

Significantly higher fruit yield per tree might be due to increased percentage of both setting and retention of fruits, highest number of fruits per tree, fruit weight, fruit length and width with the help of 50% pruning intensity in May i.e. all these yield attributing characters paved the way for significant improvement in fruit yield per tree of guava. Another scientific explanation for significantly increasing yield with moderate pruning (50% pruning intensity) may be because of more open tree canopy with wider leaf area resulted allowing more light penetration that lead to assimilation of more photosynthates materials and also less competition for the growth of individual fruit as compared to unpruned tree under optimum time of pruning (1st week of May) condition.

The present finding is in close agreement with earlier scientist's viz. Pilania *et al.*, (2010), Sah *et al.*, (2017) observed significantly higher fruit weight, number of fruits per plant and fruit yield per plant by 50% shoot pruning during rainy season. Similar findings also observed by Hiremath *et al.*, (2017), Nandi *et al.*, (2017).

It may be concluded from the results obtained in present investigation that 50% pruning intensity in May month was found to be most effective to improve growth parameters like number of new shoots, shoot length, number of flower per tree and also on yield attribute like number of fruits per tree, fruit yield kg per tree. Therefore, 50% pruning of shoot in the month of May can be recommended to obtained higher yield and quality production of guava fruit in the Indo-gangetic plains of eastern Uttar Pradesh.

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