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Assess the effect of pruning and plant growth regulators on growth, flowering and fruiting of ber tree

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Abstract

The present study was conducted with objective to know the effect of different pruning intensity and plant growth regulators on growth parameters and fruiting behavior Gola cultivar. The present was comprised four different pruning intensity of previous season growth viz., P₀ – no pruning, P₁- 25 % pruning, P₂- 50 % pruning, P₃- 75 % pruning and plant growth regulators viz., C₀-control, C₁- GA₃ @ 10 ppm and C₂- NAA @ 10 ppm. The present study revealed that the maximum plant height and plant spread have been achieved by employing 75% pruning + GA₃ 10ppm (P₃C₁) having significant variations. The highest number of sprouted shoots per branch and shoot length have been obtained by 75% pruning + GA₃ 10ppm (P₃C₁) closely followed by 75% pruning + NAA 10ppm and lowest being in un-pruned shoots + water spray. Early flower initiation was observed with un-pruned shoots (control) as compared to pruned shoots and similar observations have been recorded in case of 50% flowering. Significantly maximum number of fruit set (60.14%), fruit retention (43.80%) were recorded with 50% pruning + GA₃ 10 ppm (C₁) followed by 50% pruning + NAA 10 ppm (P₂C₂).

Keywords: Ber, Pruning, PGRs

Introduction

Ber (*Zizyphus mauritiana* Lamk.) is an ancient fruit tree of India and China. It belongs to family Rhamnaceae and is probably native to India. Ber is also known as Chinese date or Chinese fig or plum and commonly considered as “poor man’s fruit”. Ber is an important minor fruit of India which is reported to be grown in other countries like Iran, Syria, Australia, USA, France, certain parts of Italy, Spain and Africa. It is also reported that the Indian ber is an important fruit crop grown in tropical, sub tropical and arid regions of the world. It can be grown even on marginal soils and under various kinds of waste land situations such as sodic soil, saline soil, ravines, arid and semi-arid regions including plateau area of Bundelkhand and Southern India.

The ripe ber fruits have high nutritive values and it is richer than apple in protein, phosphorus, calcium and vitamin ‘C’ and one hundred gram of edible ber fruits contains moisture (85.9%), protein (0.8g), fat (0.1g), carbohydrate (12.88%), calcium (0.03g), phosphorus (0.03g), iron (0.8g), carotene (70 IU) and vitamin ‘C’ (50-100mg).

Pruning is practiced as a tree management operation in many temperate fruit species. Essentially pruning maintains an ideal balance between the growth and the fruiting. Pruning is dependent on the plant height and the canopy spreads. The objective of pruning is to produce more number of fruits with high quality marketable fruits at a low cost. Apart from these, pruning also lead to rejuvenation, better ventilation, higher penetration of sun light and also become feasible in application of plant protection chemicals.

Pruning in ber is pre-requisite for the better yield and quality of fruits because its bear on current season’s growth. Therefore, it is very much essential to ascertain the extent of pruning in particular cultivars.

The foliar feeding of fruit tree has gained much importance in recent years for plant growth regulators application. The beneficial effects of foliar application of plant growth regulators is based on the fact that it reach directly to leaves which are the site of metabolism in the plants.

Materials and Methods

In the present study, 27 years old plants of ber cv. Gola having uniform vigour and productivity were selected as experimental material to find out effect of pruning intensity and plant growth regulator on plant growth, fruit yield and quality of fruits.

The present investigation was carried out at the main experimental station, Department of Horticulture, N.D.U.A. & T, Narendra Nagar (Kumarganj), Faizabad (U.P.) during the year 2015-2016.

The experiment was laid out in Factorial Randomized Block Design with 12 treatments and 3 replications.

Experimental Details

The details of experimental plan employed in present investigation were as follows:

Pruning intensity: 4

- P0 : No pruning of previous season growth
 P1 : 25% pruning of previous season growth
 P2 : 50% pruning of previous season growth
 P3 : 75% pruning of previous season growth

Plant Growth Regulator and Water:

C₀: Water spray (control)

C₁: GA₃- 10 ppm

C₂: NAA- 10 ppm

Total No. of treatments : 12

Experimental design : Factorial R.B.D. (Randomized Block Design)

Replication : 3

Plant unit : 1

Total number of plants in experiment: 36

Time of pruning : 3rd week of May

The pruning was done on one year old shoots in the 3rd week of May with the help of secateurs.

Method of preparation of solution of plant growth regulators

The solutions were prepared as per concentrations of plant growth regulators (GA₃ and NAA). The required quantity of chemicals were weighed and dissolve in distilled water and absolute alcohol in measuring cylinder respectively. The dissolved solution were diluted and volume made up to 10 liters in plastic buckets as per required quantity of solutions.

Results and Discussion

Effect of pruning intensity and plant growth regulators on plant growth parameters

Practically, pruning in the fruit crops depend upon its fruit-bearing pattern. In ber crop, flowers borne in axils of leaves of current season young shoots (Bal *et al*, 1984) ^[84], therefore, among all cultural operations, pruning in ber is primarily most important and worthy annual operation, resulted judiciously pruned tree-vigour and shape is maintained and productivity of fruit trees and qualities of fruits were improved. Plant growth regulators help in increasing the vegetative growth of plant.

Table 1: Effect of pruning intensity and plant growth regulators on plant height (m) of ber cv. Gola.

Plant Growth Regulators	Pruning intensity				Mean
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	
C ₀ (Water)	4.51	4.81	4.91	5.22	4.86
C ₁ (GA ₃ 10 ppm)	4.70	4.98	5.27	5.55	5.13
C ₂ (NAA 10 ppm)	4.61	5.11	5.28	5.36	5.09
Mean	4.60	4.90	5.09	5.39	4.99
	A	B	A x B		
SEm±	0.013	0.012	0.023		
CD at 5%	0.039	0.034	0.067		

Table 2: Effect of pruning intensity and plant growth regulators on plant spread (m) of ber fruit cv. Gola.

Plant Growth Regulators	Pruning intensity				Mean
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	
C ₀ (Water)	3.50	4.24	4.25	4.39	4.10
C ₁ (GA ₃ 10 ppm)	3.51	4.37	4.53	4.60	4.25
C ₂ (NAA 10 ppm)	3.52	4.30	4.40	4.59	4.21
Mean	3.51	4.27	4.33	4.50	4.15
	A	B	A x B		
SEm±	0.009	0.008	0.016		
CD at 5%	0.026	0.023	0.045		

Table 3: Effect of pruning intensity and plant growth regulators on sprouted shoots/branch of ber fruit cv. Gola.

Plant Growth Regulators	Pruning intensity				Mean
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	
C ₀ (Water)	4.24	5.23	5.34	5.57	5.10
C ₁ (GA ₃ 10 ppm)	4.29	5.40	6.47	6.57	5.69
C ₂ (NAA 10 ppm)	4.32	5.41	5.61	6.51	5.48
Mean	4.28	5.32	5.48	6.07	5.29
	A	B	A x B		
SEm±	0.009	0.008	0.016		
CD at 5%	0.027	0.023	0.047		

Table 4: Effect of pruning intensity and plant growth regulators on shoot length (cm) of ber fruit cv. Gola.

Plant Growth Regulators	Pruning intensity				
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	Mean
C ₀ (Water)	257.96	266.79	268.27	281.26	268.57
C ₁ (GA ₃ 10 ppm)	262.17	280.96	306.27	312.22	289.99
C ₂ (NAA 10 ppm)	264.17	271.86	282.25	310.58	282.63
Mean	261.06	269.33	275.26	296.74	275.60
	A	B	A x B		
SEm±	1.270	1.100	2.200		
CD at 5%	3.678	3.186	6.371		

Table 5: Effect of pruning intensity and plant growth regulators on days taken to flower initiation of ber cv. Gola.

Plant Growth Regulators	Pruning intensity				
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	Mean
C ₀ (Water)	90.95	92.98	94.57	94.43	93.23
C ₁ (GA ₃ 10 ppm)	91.35	93.67	95.93	95.70	94.16
C ₂ (NAA 10 ppm)	91.16	93.22	95.80	94.89	93.77
Mean	91.15	93.33	95.25	95.07	93.70
	A	B	A x B		
SEm±	0.025	0.022	0.043		
CD at 5%	0.072	0.063	0.125		

Table 6: Effect of pruning intensity and plant growth regulators on days taken to 50% flowering of ber cv. Gola.

Plant Growth Regulators	Pruning intensity				
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	Mean
C ₀ (Water)	114.11	117.23	118.45	118.42	117.05
C ₁ (GA ₃ 10 ppm)	114.35	117.40	121.45	121.21	118.60
C ₂ (NAA 10 ppm)	114.27	117.33	121.31	118.54	117.86
Mean	114.23	117.32	119.95	119.82	117.83
	A	B	A x B		
SEm±	0.016	0.014	0.027		
CD at 5%	0.046	0.040	0.080		

Table 7: Effect of pruning intensity and plant growth regulators on fruit set (%) of ber fruit cv. Gola.

Plant Growth Regulators	Pruning intensity				
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	Mean
C ₀ (Water)	46.92	49.18	55.26	54.05	51.35
C ₁ (GA ₃ 10 ppm)	48.37	53.60	60.14	57.65	54.94
C ₂ (NAA 10 ppm)	47.49	52.25	58.22	55.88	53.46
Mean	47.65	51.39	57.70	55.85	53.15
	A	B	A x B		
SEm±	0.061	0.052	0.105		
CD at 5%	0.175	0.152	0.304		

Table 8: Effect of pruning intensity and plant growth regulators on per cent fruit retention of ber fruit cv. Gola.

Plant Growth Regulators	Pruning intensity				
	0 % (P ₀)	25 % (P ₁)	50 % (P ₂)	75 % (P ₃)	Mean
C ₀ (Water)	31.12	36.24	39.98	39.61	36.74
C ₁ (GA ₃ 10 ppm)	33.04	38.43	43.80	42.85	39.53
C ₂ (NAA 10 ppm)	31.71	38.36	43.38	40.11	38.39
Mean	32.08	37.34	41.89	41.23	38.13
	A	B	A x B		
SEm±	0.060	0.052	0.104		
CD at 5%	0.174	0.151	0.302		

Tree canopy or vegetative growth characters of ber cv. Gola viz., plant height, plant spread, number of sprouted shoots per branch and shoot length were significantly influenced by employing various pruning intensities with application of plant growth regulators (GA₃ 10ppm and NAA 10 ppm). However, maximum plant height and plant spread were obtained with 75% pruning + 10 ppm GA₃ differences were found significant.

Maximum number of sprouted shoots per branch were recorded with 75% pruning +10ppm GA₃ and there after decreased. Similar observation expressed by Singh *et al.*

(1978). Significantly higher shoot length (312.22 cm) has been achieved by 75% pruning intensity+ 10ppm GA₃ as compared to un-pruned tree (control). The present results are in conformity to earlier workers (Chovatia, 1991 and Kundu, 1994). They advocated higher shoot length in ber cv. Gola affected due to pruning intensities.

Effect of pruning intensity and plant growth regulators on flowering and fruiting behaviour and yield parameters

Days taken to flower initiation and days taken to 50% flowering were affected significantly by various pruning intensities. However, in un-pruned (control) shoot, flower

initiation started 2-4 days earlier than 25%, 50% and 75% pruning intensity. Similar findings were also advocated by various workers viz. Lal and Prasad (1980) ^[9].

Maximum fruit set (60.14%) and fruit retention (43.80 %) was observed by 50% pruning intensity + 10 ppm GA₃ having significant variations over other treatments. Significantly higher fruit set (%) and fruit retention (%) have been achieved due to moderate 50% pruning intensity + 10 ppm GA₃ which might be owing to proper balance of nutrients and metabolites needed for fruit setting and ultimately fruit retention may be because of more open tree canopy resulted allowing more light penetration that led assimilation of more photosynthetic materials in pruned shoots. The present findings are in agreement with Lal and Prasad (1980) ^[9], Dhaliwal and Sandhu (1982) ^[4], who advocated higher fruit set (%) and fruit retention (%) in ber crop due to pruning and plant growth regulators. Khan and Syamal (2004) ^[7] reported that in Kagzi lime, moderate pruning gave good result. Kale *et al.* (2000) reported that foliar spray with GA₃ and NAA 10 ppm and 20 ppm increases fruit size in ber.

Significantly higher fruit weight (23.69 gm) was recorded with application of 75% pruning intensity +10ppm NAA as compared to 75% pruning intensity + 10ppm GA₃ and control, which may be due to higher nutrients availability to the fruits. The similar results are reported by earlier workers Bajwa and Sarowa (1977) ^[1], Gupta and Singh (1977) ^[5], Singh and Bal (2008) and Singh *et al.* (2007) ^[10]. They advocated that maximum fruit weight was obtained with 8th bud retention when pruning employed in ber fruit crop with application of GA₃.

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