



## Effect of time and level of pruning on flowering, fruit-set and nut yield in cashew

**B. Prasanna Kumar\*, D. Srihari and K. Umamaheswara Rao**

*Horticultural College Research Institute, Venkataramannagudem, West Godavari Dt., Andhra Pradesh, India*

*(Manuscript Received: 26-06-13, Revised: 07-10-13, Accepted: 04-11-13)*

**Keywords:** Cashew, fruits per panicle, nut yield, pruning

Cashew (*Anacardium occidentale* L.) is evergreen, hardy crop growing in the poor soils in the coastal belt of Southern states of India. There has been wide spread efforts to reduce tree size, increase tree density and improve growth and yield (Nalini, 2002). The total yield of a crop is related to the total light interception (Jackson 1980). It has been observed the real productive branches are the 6<sup>th</sup> order branches in cashew. Often, the 6<sup>th</sup> order branches that develop in the lower strata of the canopy become unproductive due to poor light penetration. Two approaches are possible to improve light penetration and distribution in cashew. One approach is breeding relatively natural tree which allows light penetration through the canopy and secondly by providing a small opening in the tree canopy by manipulating the canopy (Nalini, 2002). Pruning may be helpful in changing the pattern of branching and flushing in cashew like any other perennial crop. Khan *et al.* (1987) reported that the pruning dead wood alone in older trees helped in increasing the nut yield by 32-40 per cent. The present study was taken up on pruning of different shoots in different months and observed for flowering and nut yield characters in cashew under local conditions of Bapatla in Andhra Pradesh.

A field trial was carried out on 5 year old cashew trees (n= 48) in the scion block of Cashew Research Station, Bapatla, Guntur district, Andhra Pradesh planted at 4 x 4 m spacing in sandy soil.

Two varieties viz., BPP-4 and BPP-6 were subjected to pruning treatments of leader shoot pruning, lateral shoot pruning and leader + lateral shoot pruning during 3 different months mid-July, mid-August and mid-September, uniformly on the shoots measuring 5 cm from apex of every shoot during the year of study. The observations in a square meter area in all four directions in each tree for the important characters such as number of flowering shoots, number of non-flowering shoots, number of panicles per unit area and the locations of flowering in days, number of hermaphrodite flowers per panicle, sex ratio, percentage fruit set, number fruits per panicle, number of nuts reached maturity, nut weight and nut yield per tree were recorded and data was statistically analysed.

Maximum number of flowering shoots (23.75) of surface canopy area was recorded by mid-August pruning and found to be significantly superior over other pruning time treatments. The least number of flowering shoots of 21.83 m<sup>2</sup> area of surface canopy was recorded by mid-September pruning indicating that the delay by a month may result in the reduction of number of flowering shoots m<sup>2</sup> area of tree surface canopy. Among the levels of pruning in cashew with respect to number of flowering shoots per m<sup>2</sup> area of the surface canopy, pruning of leader shoot showed better results producing a maximum of 27.59 m<sup>2</sup> registering 35.7 per cent increase over control (20.33 m<sup>2</sup>) (Table-1). It indicated that under local agro-climatic conditions, irrespective of the

\*Corresponding Author: [prasanna652002@yahoo.com](mailto:prasanna652002@yahoo.com)

**Table 1. Effect of variety, time of pruning and levels of pruning on number of flowering shoots m<sup>-2</sup>, number of non-flowering shoots m<sup>-2</sup>, number of panicles m<sup>-2</sup>, time of flowering, number of hermaphrodite flowers panicle<sup>-1</sup> and sex ratio (male to hermaphrodite flowers) in cashew**

	Number of flowering shoots m <sup>-2</sup>	Number of non-flowering shoots m <sup>-2</sup>	Number of panicles m <sup>-2</sup>	Time of flowering (days)	Number of hermaphrodite flowers panicle <sup>-1</sup>	Sex ratio (male to hermaphrodite flowers)						
<b>Varieties:</b>												
BPP-4 (V1)	24.40	9.62	20.57	91.29	133.60	4.87						
BPP-6 (V2)	20.79	9.29	17.98	94.04	126.70	7.67						
<b>Time of pruning:</b>												
Mid-July (T1)	22.21	9.25	18.13	92.81	128.49	5.89						
Mid-August (T2)	23.75	8.68	20.33	92.81	135.34	6.56						
Mid-September (T3)	21.83	10.44	19.29	93.50	126.73	6.35						
<b>Level of pruning:</b>												
Control (No pruning) (L0)	20.33	10.42	17.56	90.17	118.30	5.72						
Leader shoot pruning (L1)	27.59	8.92	18.81	92.58	145.60	7.39						
Lateral shoot pruning (L2)	21.87	10.25	18.91	93.25	116.20	6.33						
Leader + Lateral shoot pruning (L3)	25.58	8.25	17.71	96.16	140.70	5.64						
	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>
Varieties	0.29	0.59	0.34	NS	0.29	0.59	0.25	0.51	0.74	1.54	0.09	0.20
Time of pruning	0.35	0.73	0.42	0.86	0.35	0.73	0.30	NS	0.91	1.88	0.12	0.25
Levels of pruning	0.41	0.84	0.48	0.99	0.41	0.84	0.35	0.73	1.05	2.17	0.14	0.28

variety, pruning of leader shoot in mid-August is useful to increase the productivity through production of more number of flowering shoots (23.75 m<sup>2</sup>) as shown in Table 1 and 1a. This could be attributed to more availability of nutrients and water and a balanced vegetative and reproductive growth as stated by Nalini (2002) in cashew and Srihari and Rao (1998), Suresh Kumar *et al.* (2003) in mango.

The mid-August pruning recorded maximum number of panicles per m<sup>2</sup> (28.63) area while that of the BPP-6 produced more number of panicles after mid-July pruning of 28.50 m<sup>2</sup>. This could be probably due to availability of sufficient food material for early panicle formation in the off-season flowering type of BPP-6. Irrespective of variety and time the level of pruning the leader shoot pruning resulted maximum number of panicles per m<sup>2</sup> of 18.81 was recorded and on par with the lateral shoot pruning of 18.91 m<sup>2</sup> (Table-1). It is probably

due to early activation of buds and early production of large number of reproductive shoots and the opportunity of accumulating adequate photosynthates in the leaf which might be responsible for higher production of panicles with maximum number of panicles per square meter area as reported by Mohan and Singh (1988).

The time of flowering, non-significant differences among the treatments for time of pruning was recorded which the flowering in cashew is mainly seasonal, the flowering duration is not much important as the flower bud differentiation and development normally takes place in a short spell of one month during October to November. However, the significant difference among the varieties for level of pruning and lowest time of flowering in leader shoot pruning (92.58) in mid-August when compared to no pruning (90.5) (Table-1) was recorded. Therefore, irrespective of variety, the influence of level of pruning and time

**Table 1a. Effect of variety, time of pruning and levels of pruning on Number of flowering shoots m<sup>-2</sup>, number of non-flowering shoots m<sup>-2</sup>, number of panicles m<sup>-2</sup>, time of flowering ,number of hermaphrodite flowers panicle<sup>-1</sup> and sex ratio (male to hermaphrodite flowers) in cashew**

	Number of flowering shoots m <sup>-2</sup>	Number of non-flowering shoots	Number of panicles m <sup>-2</sup>	Time of flowering (duration in days)	Number of hermaphrodite flowers panicle <sup>-1</sup>	Sex ratio (male to hermaphrodite flowers)
<b>INTERACTION:</b>						
V1L0T1	18.50	13.00	12.13	90.5	96.9	8.04
V1L1T1	28.50	5.50	29.63	88.0	124.5	4.14
V1L2T1	24.50	8.50	20.63	87.5	97.5	3.35
V1L3T1	24.90	6.50	19.25	90.0	112.8	5.10
V1L0T2	20.50	16.50	16.00	90.5	97.9	8.27
V1L1T2	30.65	4.00	28.63	92.5	203.3	7.20
V1L2T2	26.25	6.50	23.62	89.5	168.0	3.12
V1L3T2	26.50	4.50	19.75	91.5	112.5	7.72
V1L0T3	19.50	24.50	16.12	90.5	97.5	5.77
V1L1T3	27.00	4.00	26.00	93.5	163.0	5.06
V1L2T3	27.50	7.50	21.00	95.0	169.5	3.15
V1L3T3	18.50	14.50	13.50	96.5	161.0	3.53
V2L0T1	11.00	26.50	8.50	92.5	98.0	8.96
V2L1T1	22.50	5.00	28.50	90.5	181.5	6.75
V2L2T1	17.00	4.00	18.00	92.0	111.3	9.10
V2L3T1	15.00	6.50	15.50	93.5	98.0	10.74
V2L0T2	13.00	14.50	10.00	94.5	107.5	9.00
V2L1T2	31.50	5.50	23.50	94.5	154.3	4.08
V2L2T2	25.00	5.00	17.00	95.5	163.0	4.03
V2L3T2	22.50	7.50	19.00	96.0	66.5	7.44
V2L0T3	11.50	13.50	18.00	96.5	89.5	9.79
V2L1T3	30.00	6.00	23.00	97.5	128.3	7.95
V2L2T3	29.00	8.50	18.75	96.5	122.7	6.05
V2L3T3	21.50	9.00	16.00	98.0	99.6	8.08
SEm	0.99	1.17	0.99	0.86	2.58	0.28
CD (0.05)	2.07	2.43	2.06	NS	5.33	0.58

of pruning on the character duration of flowering will remain same and negligible.

The percentage of fruit set of 5.01 in BPP-6 and 4.33 in BPP-4 were recorded. As it is influenced by different time of pruning the mid-August pruning recorded a maximum of 5.14 over other times of pruning. However, for the interaction effect the percentage of fruit set the pruning of leader shoot of the variety BPP-4 in mid-August (7.50) and the variety BPP-6 in mid-July (9.21) recorded maximum percentage of fruit set. These

observations are further confirming that pruning of leader shoot in mid-August for BPP-4 and in mid-July for BPP-6 are better for incremental productivity in a flowering shoots of cashew. This might be due to the remaining flowers being dropped at various stages of development as reported by Nair *et al.* (1979) (Table 2 & 2a).

The Number of fruits per panicle recorded non-significant difference in the variety, time of pruning but significant difference for their level of pruning and recorded highest of 5.53 (Table 2) for the

**Table 2. Effect of variety, time of pruning and levels of pruning on Percentage of fruit set, number of fruits panicle<sup>-1</sup>, number of fruits panicle<sup>-1</sup>, nut weight and nut yield per tree in cashew**

	Percentage of fruit set	Number of fruits panicle <sup>-1</sup>	Number of nuts reached maturity m <sup>-2</sup>	Nut weight (g)	Nut yield tree <sup>-1</sup> (kg)					
<b>Varieties:</b>										
BPP-4 (V1)	4.33	5.31	48.58	4.43	2.602					
BPP-6 (V2)	5.01	5.32	46.01	5.31	2.777					
<b>Time of Pruning:</b>										
Mid-July (T1)	3.92	5.22	44.91	4.96	2.853					
Mid-August (T2)	5.14	5.43	50.83	4.77	2.628					
Mid-September (T3)	4.93	5.30	46.16	4.87	2.587					
<b>Level of Pruning:</b>										
Control (No pruning) (L0)	5.63	4.67	43.42	4.68	2.383					
Leader shoot pruning (L1)	4.63	5.03	45.98	4.87	2.945					
Lateral shoot pruning (L2)	4.39	5.02	45.56	4.89	2.688					
Leader + Lateral shoot pruning (L3)	4.02	5.53	54.23	5.04	2.741					
	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>	<b>S Em</b>	<b>CD</b>
Varieties	0.08	0.17	0.09	NS	0.61	1.27	0.04	0.09	0.026	0.054
Time of pruning	0.09	0.20	0.11	NS	0.75	1.55	0.05	0.11	0.032	0.065
Levels of pruning	0.12	N.S.	0.13	0.26	0.86	1.79	0.06	0.13	0.037	0.076

treatment leader + lateral shoot pruning. However, for these interaction effects the number of fruits per panicle was found in the treatment of pruning of leader shoot in the month of August in case of BPP-4 (7.25) and in mid-July in case of BPP-6 varieties of cashew (7.50) (Table 2). The late season variety BPP-6 needs pruning in the early of July month which produce more of product shoot and panicles with more hermaphrodite flowers increased the number of fruits per panicle when compared to BPP-4 variety needs mid-August pruning.

The number of nut reached maturity m<sup>-2</sup> as influenced by pruning showed significant difference among the varieties in the highest of 48.55 in BPP-4, for the time of pruning mid-August 50.83 and among the different levels of pruning the leader + lateral shoot pruning recorded maximum of 54.23 (Table 2). However, for their interaction effects if the fruit drop per m<sup>2</sup> of tree canopy and percentage of drop were observed, maximum drop was found to be recorded by the same treatments of pruning

of leader shoot pruning in mid-August (26.00) as in the case of BPP-4 and mid-July in the case of BPP-6 (23.38) (Table 2a). These results are clearly demonstrating that a pruned plant requires adequate nutrient supply immediately after pruning, failing which there is a probability of low yield through larger fruit drop at various stages.

The nut weight was obtained in the treatment of pruning the leader shoot in mid-August to mid-September months in both the varieties in the year of study. The variety BPP-6 recorded a better nut weight of 5.31 g and found significantly superior whereas the variety BPP-4 recorded 4.43 g (Table 2). Among the levels of pruning, leader as well as lateral shoot pruning during both the varieties in both the years of study was found to be significantly superior over other levels of pruning registering 5.04 g (Table 2) of over other levels of pruning.

In several crops *viz.*, citrus (Moore, 1959), Guava (Sundarajan and Muthuswamy, 1964) and mango (Rao and Shanmugavelu, 1975), Srihari and

**Table 2a. Effect of variety, time of pruning and levels of pruning on Percentage of fruit set, Number of fruits panicle<sup>-1</sup>, Number of nuts reached maturity m<sup>-2</sup>, nut weight and nut yield tree<sup>-1</sup> in cashew**

	Percentage of fruit set	Number of fruits panicle <sup>-1</sup>	Number of nuts reached maturity per m <sup>2</sup>	Nut weight (g)	Nut yield tree <sup>-1</sup> (kg)
<b>INTERACTION:</b>					
V1L0T1	3.61	3.75	28.00	4.11	1.350
V1L1T1	5.13	6.38	52.63	4.10	3.900
V1L2T1	6.16	5.90	60.00	4.3	3.775
V1L3T1	3.62	3.90	39.00	4.09	2.875
V1L0T2	3.96	3.90	26.00	3.94	1.300
V1L1T2	7.50	7.25	72.00	4.72	3.700
V1L2T2	2.07	5.65	54.00	5.00	3.325
V1L3T2	4.88	5.55	55.88	4.49	2.700
V1L0T3	4.73	4.40	35.00	3.91	1.300
V1L1T3	4.06	6.03	71.88	4.96	2.450
V1L2T3	3.68	6.25	64.63	5.10	2.400
V1L3T3	2.49	4.15	28.00	4.45	2.150
V2L0T1	5.22	5.40	23.38	4.36	1.400
V2L1T1	9.21	7.50	56.75	5.27	3.800
V2L2T1	4.46	5.15	44.75	5.95	3.450
V2L3T1	5.08	5.25	44.00	4.95	3.250
V2L0T2	3.96	4.25	30.13	5.68	1.250
V2L1T2	3.64	5.65	64.75	5.84	3.750
V2L2T2	3.61	5.90	47.00	6.12	3.550
V2L3T2	5.45	3.60	54.38	5.07	3.225
V2L0T3	5.59	5.00	27.13	4.77	2.350
V2L1T3	4.09	5.25	56.00	6.14	2.500
V2L2T3	4.89	6.00	66.25	4.53	2.450
V2L3T3	4.89	4.90	37.62	5.03	2.350
SEm	0.34	0.31	2.12	0.20	0.089
CD (0.05)	0.69	0.63	4.39	0.30	0.186

Rao (1998) it was reported that pruning was beneficial in increasing the per tree yield. But, similarly in the present study of cashew, a significant difference due to varieties, kind of pruning and time of pruning were observed for the character nut yield per tree. The variety BPP-6 with a nut yield of 2.777 kg tree<sup>-1</sup> was found to be significantly superior over other variety BPP-4 (2.602 kg tree<sup>-1</sup>) under sandy soil situation Bapatla. Among the pruning techniques pruning of leader shoots in mid-July was found to be beneficial during the study to produce higher per tree yield

of nuts (2.945 kg tree<sup>-1</sup>) with a percentage increase of 23.6 per cent over control (2.383 kg tree<sup>-1</sup>) (Table-2). The production of flowering shoots, number of panicles m<sup>-2</sup>, percentage of fruit set, number of fruits panicle<sup>-1</sup>, number of nuts reached maturity m<sup>-2</sup>, nut weight and nut yield of cashew as influenced by the variety, level of pruning and time of pruning it is observed that a moderate increase in number of flowering shoots could be obtained by pruning the leader shoot in mid-August, the vigorous variety BPP-4 and late season variety BPP-6 responded for pruning to increase productivity under local agro-climatic condition of Bapatla.

## References

- Khan, M. M. Kumar, D. P. and Hiremath, I. G. 1987 Pruning studies in cashew. *The Cashew* **1**(1):11-12.
- Mohan, E. 1983. Studies on the effect of pruning and growth regulators on vegetative growth and flowering in cashew (*Anacardium occidentale* L.). M.Sc.,(Agri.) Thesis, University of Agricultural Sciences, Bangalore, pp. 108.
- Mohan, E. and Singh, R. 1988. Effect of time and severity of pruning in cashew (*Anacardium occidentale* L.) *Journal of Plantation Crops* **18** (supplement): 7-10.
- Nair, M. K. Bhaskara Rao, E.V.V. Nambiar, K.K.N and Nambiar, M.C. 1979. Cashew (*Anacardium occidentale* L.) Central Plantation Crops Research Institute, Kasargod, India. pp. 1-169.
- Nalini, P.V. 2002. Canopy architecture and management in cashew: Recent trends in cashew nut production and processing. pp. 34-38.
- Rao, V.N.M. and Shanmugavelu, K. G. 1975. Mango responds to pruning. *Indian Horticulture* **20**(3): 5-6.
- Rathi, D.S. Dimri, D.C. Nautiyal, M.C. and Kumar, A. 2003. Pruning response to shoot growth, fruit set and yield in peach. *Indian Journal of Horticulture* **60**: 25-30.
- Srihari, D. and Rao, M.M. 1998. Induction of flowering and cropping in 'off' phase Alphonso mango trees by pruning of fruited shoots. *Karnataka Journal Agricultural Science* **11**(1): 260-62.
- Sundararaj, J.S. Muthuswamy, S. and Shanmugavelu, K.G. and Sundarajan, S. 1969. Effect of notching of buds and pruning of shoots on growth and productivity in *Ficus carica*, *Indian Journal of Horticulture* **26**: 27-31.
- Suresh Kumar, P. and Reddy, Y.N. and Srihari, D. 2003. Effect of pruning on production of new shoots, subsequent growth and flowering of mango cv. Baneshan. *Journal of Research ANGRAU* **31**(1): 26-30.