Int.J.Curr.Microbiol.App.Sci (2017) *6*(4): 606-614

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 4 (2017) pp. 606-614**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.604.073

Reproductive Behaviour of Lemon (*Citrus limon* Burm.) Affected by Different Pruning Intensities and Integrated Nutrient Management under Various Growing Season

A. Ghosh[1,5]*, K. Dey[1,5], N. Bhowmick[1], P.S. Medda[2], A.N. Dey[3] and A. Ghosh[4]

[1]Department of Pomology and Post Harvest Technology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar-736165, India
[2]Department of Plantation Crops and Processing, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar-736165, India
[3]Department of Forestry, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar-736165
[4]Department of Agricultural Statictics, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar-736165, India
[5]Department of Fruits and Orchard Management, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia-741252, India
**Corresponding author*

Keywords

Lemon, Nutrient management, Pruning, Reproductive behaviour.

Article Info

Accepted:
06 March 2017
Available Online:
10 April 2017

A B S T R A C T

The main objective of this study was to know the reproductive behaviour of lemon (*Citrus limon* Burm.) affected by different pruning intensities and integrated nutrient management under various growing season. The experiment was laid out in two factorial Randomized Block Design with four levels of pruning, seven levels of nutrient, consisting recommended dose of fertilizers (RDF) and different combinations of organic manure (Vermicompost), inorganic fertilizer, bio-fertilizer (*Azotobacter*), mycorrhiza (VAM) and their interaction to study their effect on plant reproductive behaviour during 2013 to 2015 on 9 year old lemon plants in three growing seasons. The investigation revealed that the reproductive parameters viz. number of flowers per plant, fruit set percentage and fruit yield were found highest in lightly pruned plants feed with 75% RDF + Vermicompost + *Azotobacter* + Vesicular Arbuscular Mycorrhiza at Ambe, Mrig and Hasth bahar respectively. Among the three season of cropping Ambe bahar recorded the best result in respect to yield followed by Mrig and Hasth bahar.

Introduction

Citrus is the most economically important fruit crop in the world, is grown in developed and developing countries and certainly constitutes one of the main sources of vitamin C. There is also an increasing demand of "high quality fresh citrus" driven by World Health Organization recommendations (Iglesias *et al.,* 2007). Assam Lemon is one of the important varieties of lemon, extensively grown in the north-eastern parts of India. In northern parts of West Bengal, it is early bearing with three fruiting season, viz. April-May, August-September and November-December. The earlier vegetative flushes of

the previous season growth generally are more productive (Singh and Saxena, 2008). It was observed that the main reason for declining the productivity of the plant is unbalanced overcrowded orchard which also resulted in high disease-pest infestation (Singh and Dhaliwal, 2004). Therefore pruning is essential to maximize sunlight penetration which not only influences the flowering and fruit set but also enhances fruit quality and colour development. As lemon plants bears three times in a year, proper manuring and fertilization has also to be resorted for obtaining highest yields and quality production (Khehra and Bal, 2014). However, the continuous use of chemical fertilizers has degraded the soil health in terms of fertility, productivity and has also caused soil pollution. In such a situation, combine application of organic, inorganic and biofertilizers need to resort for avoiding the deleterious effect of chemical fertilizers and as well as improves physical properties of soil. As, information about the response of lemon against pruning and nutrient management is lacking for this area, the present investigation was conducted to know the reproductive behaviour of lemon (*Citrus limon* Burm.) affected by different pruning intensities and integrated nutrient management under various growing season.

Materials and Methods

The present investigation was carried out during 2013 to 2015 on 7 years old lemon cv. Assam lemon plants planted at 3m × 3m spacing at Instructional farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal, India ($26^0$19'86'' N latitude and $89^0$23'53" E longitude). There were 4 levels of pruning, namely P0- No pruning (Control), P1- 25 cm pruning from the terminal portion of the shoot, P2- 50 cm pruning from the terminal portion of the shoot, P3- 75 cm pruning from the terminal portion of the shoot and 7 treatments of nutrient management viz. N1- 100% Recommended Dose of Fertilizer (N@210g/plant- P@140g/plant- K@210g/ plant), N2- Vermicompost (20kg/plant) + *Azotobacter* (18g/plant) +Vesicular Arbuscular Mycorrhiza (150g/plant), N3- Vermicompost, N4- 75% RDF+Vermicompost +*Azotobacter* + Vesicular Arbuscular Mycorrhiza, N5- 75% RDF+Vermicompost, N6- 50% RDF+ Vermicompost +*Azotobacter* + Vesicular Arbuscular Mycorrhiza and N7- 50% RDF+Vermicompost were applied alone and in combination with different levels of the pruning. The experiment was laid out in two factorial asymmetrical randomized block design (RBD) and 28 treatment combination (4 levels of pruning and 7 levels of nutrient) with 3 replications and 6 plants were kept in each treatment. All levels of pruning were done on 21st November, 2013, after harvesting of Mrigbahar. Nitrogenous fertilizer was applied in two split doses. Firstly, half dose of nitrogen and full dose of phosphorus, potassium and vermicompost were applied in February, 2014 and rest half of nitrogen was applied in April, 2014. *Azotobacter* and Vesicular Arbuscular Mycorrhiza were applied in December, 2013, after harvesting of Mrigbahar. All the reproductive parameters viz. number of flowers per plant, fruit set (%), fruit retention (%) and fruit yield were recorded from six tagged plants for each treatment at three distinct seasons *viz.* Ambe, Mrig and Hasth bahar respectively. Analysis of variance (one way classified data) for each parameter was performed using ProcGlm of Statistical Analysis System (SAS) software (version 9.3). Mean separation for different treatment under different parameter were performed using Least Significant Different (LSD) test ($P \leq 0.05$). Normality of residuals under the assumsion of ANOVA was tested using Kolmogrov-Smirnov, Shapiro-Wilk, Cramer-

Von Mises and Anderson Darling procedure using Proc-Univariate procedure of (version 9.3) SAS (Gomez and Gomez, 1983).

Results and Discussion

Number of flower

Experimental results on number of flowers per plant were showed significant variation in all the season under different pruning and nutrient level (Table 1). Maximum number of flowers per plant (408.33, 378.33 and 259) were recorded in P1 (25 cm pruning from the terminal portion of the shoot) at Ambe, Mrig and Hasth bahar followed by unpruned plantsP0 (388.33, 363.33 and 245) at Ambe, Mrig and Hasth bahar. The minimum number of flowers per plant was observed in P3 (75 cm pruning from the terminal portion of the shoot) (288, 252 and 177.33) at Ambe, Mrig and Hasth bahar respectively. The significantly highest number of flowers per plant was recorded (399, 371.67 and 250.33) in N4 (75% RDF+ Vermicompost + *Azotobacter* + Vesicular Arbuscular Mycorrhiza) and the lowest number (386.33, 360 and 224.33) were observed in N3 (Vermicompost) at three seasons respectively. The interaction between different pruning and nutrient level (Table 2) was statistically at par with respect to number of flowers proved that treatment combination have no effect on this parameter. Data revealed that T_{11} (P_1N_4) gave the maximum number of flowers per plant (454.33, 424.67 and 320) at Ambe, Mrig and Hasth bahar followed by T_{13} (P_1N_6) (446, 413 and 290.33), whereas these were minimum (242.33, 205 and 107.67) in T_{24} (P_3N_3) at three seasons respectively. The lowest number of flowers in severely pruned plants was due to loss of potential bearing wood of these plants (Nath and Baruah, 1999). The role of biofertilizer in fixation of atmospheric nitrogen and VAM involved in solubilization of phosphate are responsible for maintaining better soil environment which ultimately reflected in the flowering of the tree (Yadav *et al.,* 2011). Similar findings also reported in bael (Singh *et al.,* 2009).

Fruit set (%)

The data pertaining to fruit set (%) have been revealed that all the data were significantly different under different pruning and nutrient treatments. Maximum fruit set (%) was recorded (Table 1) in P1 (25 cm pruning from the terminal portion of the shoot) at Ambe, Mrig and Hasth bahar (63.43%, 52.22% and 40.93%) and the minimum was observed in (P0) unpruned plants (52.53%, 32.20% and 23.27%) at Ambe, Mrig and Hasth bahar respectively. In case of nutrients, the highest fruit set (%) was recorded (54.14%, 38.21% and 31.16%) in N4 (75% RDF+ Vermicompost + *Azotobacter* + Vesicular Arbuscular Mycorrhiza) at Ambe, Mrig and Hasth bahar respectively. The interaction effect (Table 2) between pruning and nutrient was highly significant with respect to fruit set (%) at Ambe, Mrig and Hasth bahar. It revealed that T_{11} (P_1N_4) gave the maximum fruit set (%) (69.11%, 52.51% and 48.75%) at Ambe, Mrig and Hasth bahar followed by T_{13} (P_1N_6) (68.83%, 52.06% and 47.19%), whereas fruit set (%) was minimum (51%, 31.94% and 21.84%) in T_3 (P_0N_3) at Ambe, Mrig and Hasth bahar respectively. These results are in close conformity with the findings in guava (Shaban and Haseeb, 2009). Increase in fruit set (%) might be due to the optimum supply of nutrients in integrated way which resulted higher photosynthates production and thereby enhanced fruit set (Yadav *et al.,* 2011).

Table.1 Effect of pruning and nutrient management on flowering and fruiting of lemon cv. Assam Lemon

	Ambe bahar			Mrig bahar			Hasth bahar		
Treatments	No. of flowers/plant	Fruit set (%)	Fruit retention (%)	No. of flowers/plant	Fruit set (%)	Fruit retention (%)	No. of flowers/plant	Fruit set (%)	Fruit retention (%)
P_0	388.33d	52.53d	50.49 (45.29)d	363.33d	32.2d	39.32d	245d	23.27 (28.86)d	21.05 (27.35)d
P_1	408.33c	63.43c	84.56 (66.89)c	378.33c	50.22c	67.89c	259c	40.93 (39.76)c	36.79 (37.35)c
P_2	349.67b	60.63b	68.87 (56.11)b	314.33b	45.81b	61.11b	212b	37.74 (37.88)b	33.75 (35.55)b
P_3	288a	58.33a	63.69 (52.95)a	252a	41.67a	56.19a	177.33a	32.14 (34.51)a	28.07 (32.01)a
SEm (±)	**5.93**	**0.07**	**0.01**	**7.33**	**0.01**	**0.01**	**5.65**	**0.01**	**0.01**
LSD (P≤0.05)	**16.82**	**0.20**	**0.03**	**20.78**	**0.02**	**0.02**	**16.02**	**0.02**	**0.02**
N_1	388.33bc	52.53c	50.49 (45.29)e	363.33cd	32.2e	39.32e	245bc	23.27 (28.86)e	21.05 (27.35)e
N_2	386.33bc	51.25d	48.48 (44.14)f	362.33d	32.02f	33.62f	245cd	21.63 (27.69)f	20.75 (27.13)f
N_3	386.33c	51d	40.61 (39.58)g	360d	31.94g	31.3g	224.33d	21.84 (27.83)g	16.33 (23.81)g
N_4	399a	54.14a	52.78 (46.61)a	371.67a	38.21a	42.25a	250.33a	31.16 (33.96)a	21.79 (27.83)a
N_5	395.67ab	53.07b	52.38 (46.38)c	365.33abc	33.67c	41.46c	245.33abc	30.57 (33.58)c	21.33 (27.49)c
N_6	397.67a	54.06a	52.09 (46.20)b	371.33ab	34.47b	42.19b	246.33ab	30.85 (33.77)b	21.05 (27.35)b
N_7	391bc	52.94b	51.69 (45.97)d	364bcd	32.42d	40.68d	245bc	28.16 (32.08)d	20.29 (26.78)d
SEm (±)	**7.85**	**0.09**	**0.01**	**9.69**	**0.01**	**0.01**	**7.47**	**0.01**	**0.01**
LSD (P≤0.05)	**22.25**	**0.27**	**0.03**	**27.49**	**0.03**	**0.03**	**21.19**	**0.03**	**0.03**

**Means with the same letter are not significantly different.

Table.2 Interaction effect of pruning and nutrient management on flowering and fruiting of lemon cv. Assam Lemon

	Ambe bahar			Mrig bahar			Hasth bahar		
Treatments	No. of flowers/plant	Fruit set (%)	Fruit retention (%)	No. of flowers/plant	Fruit set (%)	Fruit retention (%)	No. of flowers/plant	Fruit set (%)	Fruit retention (%)
T_1 (P_0N_1)	388.33	52.53	50.49(45.29)	363.33	32.2	39.32	245	23.27(28.86)	21.05(27.35)
T_2 (P_0N_2)	386.33	51.25	48.48(44.14)	362.33	32.02	33.62	245	21.63(27.69)	20.75(27.13)
T_3 (P_0N_3)	386.33	51	40.61(39.58)	360	31.94	31.3	224.33	21.84(27.83)	16.33(23.81)
T_4 (P_0N_4)	399	54.14	52.78(46.61)	371.67	38.21	42.25	250.33	31.16(33.96)	21.79(27.83)
T_5 (P_0N_5)	395.67	53.07	52.38(46.38)	365.33	33.67	41.46	245.33	30.57(33.58)	21.33(27.49)
T_6 (P_0N_6)	397.67	54.06	52.09(46.20)	371.33	34.47	42.19	246.33	30.85(33.77)	21.05(27.35)
T_7 (P_0N_7)	391	52.94	51.69(45.97)	364	32.42	40.68	245	28.16(32.08)	20.29(26.78)
T_8 (P_1N_1)	408.33	63.43	84.56(66.89)	378.33	50.22	67.89	259	40.93(39.76)	36.79(37.350
T_9 (P_1N_2)	405.67	63.11	84.38(66.74)	375.67	48.71	67.76	255	40.00(39.23)	35.29(36.45)
T_{10} (P_1N_3)	403.67	62.92	83.07(65.73)	375	48.53	67.03	252	39.29(38.82)	34.34(35.85)
T_{11} (P_1N_4)	454.33	69.11	90.76(72.34)	424.67	52.51	70.85	320	48.75(44.51)	40.38(39.47)
T_{12} (P_1N_5)	416.67	67.2	85.71(67.78)	389.33	51.37	69.5	276	43.12(41.03)	39.5(38.94)
T_{13} (P_1N_6)	446	68.83	89.9(71.47)	413	52.06	69.77	290.33	47.19(43.39)	40.15(39.35)
T_{14} (P_1N_7)	412.67	65.43	85.56(67.70)	379.67	51.1	68.56	265.67	42.53(40.69)	38.05(38.12)
T_{15} (P_2N_1)	349.67	60.63	68.87(56.11)	314.33	45.81	61.11	212	37.74(37.88)	33.75(35.55)
T_{16} (P_2N_2)	346.67	59.71	64.73(53.55)	313	45.37	59.15	211.67	37.32(37.64)	32.91(35)
T_{17} (P_2N_3)	337.33	59.59	64.68(53.55)	306	44.44	58.82	210.67	35.13(36.33)	32.43(34.70)
T_{18} (P_2N_4)	380	62.63	82.77(65.50)	358	48.04	63.37	223	39.01(38.65)	34.48(35.97)
T_{19} (P_2N_5)	373	62.47	73.39(58.95)	352	47.73	62.5	222	38.29(38.23)	34.12(35.73)
T_{20} (P_2N_6)	378	62.7	74.68(59.80)	353.67	48.07	62.94	223	38.57(38.41)	33.72(35.49)
T_{21} (P_2N_7)	351	62.39	70.78(57.29)	320	46.25	61.49	216.67	37.85(38)	32.93(35)
T_{22} (P_3N_1)	288	58.33	63.69(52.95)	252	41.67	56.19	177.33	32.14(34.51)	28.07(32.01)
T_{23} (P_3N_2)	280	54.64	63.4(52.77)	212.67	41.38	55.68	163.33	31.84(34.33)	26.92(31.24)
T_{24} (P_3N_3)	242.33	54.47	62.88(52.48)	205	40.98	54.76	107.67	31.58(34.20)	26.47(30.98)
T_{25} (P_3N_4)	327.67	59.51	64.62(53.49)	296	44.26	58.78	209.33	34.4(35.91)	31.94(34.39)
T_{26} (P_3N_5)	295.67	58.85	64.37(53.37)	276.67	41.93	56.03	199.33	33.61(35.43)	29.85(33.15)
T_{27} (P_3N_6)	325.67	58.96	64.58(53.49)	285.67	42.36	57.85	209	33.97(35.67)	30.99(33.83)
T_{28} (P_3N_7)	294.67	58.71	64.16(53.25)	254.33	41.68	55.66	182.67	32.3(34.63)	28.81(32.46)
SEm (±)	**15.70**	**0.19**	**0.02**	**19.39**	**0.02**	**0.02**	**14.95**	**0.02**	**0.02**
LSD(P≤0.05)	**NS**	**0.54**	**0.07**	**NS**	**0.06**	**0.05**	**NS**	**0.06**	**0.05**

Table.3 Effect of pruning and nutrient management on yield of lemon cv. Assam Lemon

	Ambe bahar		Mrig bahar		Hasth bahar	
Treatments	Total number of Harvested fruits	Fruit yield (kg/plant)	Total number of Harvested fruits	Fruit yield (kg/plant)	Total number of Harvested fruits	Fruit yield (kg/plant)
P_0	103d	11.52d	46d	5.48d	12d	1.38d
P_1	219c	26.71c	129c	16.86c	39c	4.96c
P_2	146b	18.11b	88b	11.80b	27b	3.45b
P_3	107a	15.06a	59a	9.13a	16a	2.36a
SEm (±)	**1.13**	**0.19**	**0.93**	**0.14**	**0.89**	**0.12**
LSD(P≤0.05)	**3.20**	**0.54**	**2.63**	**0.40**	**2.52**	**0.34**
N_1	103e	11.52e	46d	5.48d	12de	1.38de
N_2	96f	10.72f	39e	4.65e	11ef	1.27ef
N_3	80g	8.86g	36e	4.25e	8f	0.92f
N_4	114a	13.83a	60a	7.67a	17a	2.14a
N_5	110c	13.25c	51c	6.51c	16bc	2bc
N_6	112b	13.59b	54b	6.89b	16ab	2.01ab
N_7	107d	12.14d	48d	5.77d	14cd	1.63cd
SEm (±)	**1.49**	**0.25**	**1.23**	**0.19**	**1.17**	**0.16**
LSD(P≤0.05)	**4.23**	**0.71**	**3.48**	**0.53**	**3.33**	**0.45**

**Means with the same letter are not significantly different.

Fruit retention (%)

Observations on fruit retention (%) under different treatments and their combination have been presented in table 1 were statistically significant in three cropping seasons. The significantly highest fruit retention (%) was recorded in P1 (25 cm pruning from the terminal portion of the shoot) at Ambe, Mrig and Hasth bahar (84.56%, 67.89% and 36.79%) and the lowest retention (%) was observed in unpruned plants (50.49%, 39.32% and 21.05%) at Ambe, Mrig and Hasth bahar respectively. The significantly highest fruit retention (%) was recorded (52.78%, 42.25% and 21.79%) in N4 (75% RDF+ Vermicompost + *Azotobacter* + Vesicular Arbuscular Mycorrhiza) at Ambe, Mrig and Hasth bahar. The interaction effect between pruning and nutrient revealed (Table 2) that T_{11} (P_1N_4) gave the significantly maximum fruit retention (%) (90.76%, 70.85% and 40.38%) at Ambe, Mrig and Hasth bahar followed by T_{13} (P_1N_6) (89.90%, 69.77% and 40.15%), whereas minimum fruit retention (%) was recorded (40.61%, 31.30% and 16.33%) in T_3 (P_0N_3) at three seasons. It might be due to combination use of organic and inorganic fertilizers and better nutrient availability from them which was enhanced by biofertilizer and vesicular arbuscular mycorrhiza resulted in better more retention of fruits at harvest. Fruit yield was significantly different in all seasons under different pruning and nutrient treatments.

Fruit yield

The data pertaining to fruit yield revealed that maximum number of harvested fruits was recorded (Tables 3 and 4) in P1 (26.71 kg/plant, 16.86 kg/plant and 4.96 kg/plant) followed by P2 (18.11 kg/plant, 11.80 kg/plant and 3.45 kg/plant) and the lowest result was found in (P0) unpruned plants (1.52 kg/plant, 5.48 kg/plant and 1.38 kg/plant) at Ambe, Mrig and Hasth bahar

respectively. The significantly highest fruit yield was recorded (13.83 kg/plant, 7.67 kg/plant 2.14 kg/plant) in N4(75% RDF+ Vermicompost + *Azotobacter* + Vesicular Arbuscular Mycorrhiza) at Ambe, Mrig and Hasth bahar.

Table.4 Interaction effect of pruning and nutrient management on yield of lemon cv. Assam Lemon

	Ambe bahar		Mrig bahar		Hasth bahar	
Treatments	Total number of Harvested fruits	Fruit yield (kg/plant)	Total number of Harvested fruits	Fruit yield (kg/plant)	Total number of Harvested fruits	Fruit yield (kg/plant)
T_1 (P_0N_1)	103	11.52	46	5.48	12	1.38
T_2 (P_0N_2)	96	10.72	39	4.65	11	1.27
T_3 (P_0N_3)	80	8.86	36	4.25	8	0.92
T_4 (P_0N_4)	114	13.83	60	7.67	17	2.14
T_5 (P_0N_5)	110	13.25	51	6.51	16	2
T_6 (P_0N_6)	112	13.59	54	6.89	16	2.01
T_7 (P_0N_7)	107	12.14	48	5.77	14	1.63
T_8 (P_1N_1)	219	26.71	129	16.86	39	4.96
T_9 (P_1N_2)	216	26.28	124	16.17	36	4.56
T_{10} (P_1N_3)	211	25.60	122	15.87	34	4.30
T_{11} (P_1N_4)	285	35.17	158	20.86	63	8.07
T_{12} (P_1N_5)	240	29.29	139	18.25	47	5.98
T_{13} (P_1N_6)	276	33.85	150	19.78	55	7.03
T_{14} (P_1N_7)	231	28.17	133	17.43	43	5.47
T_{15} (P_2N_1)	146	18.11	88	11.80	27	3.45
T_{16} (P_2N_2)	134	16.61	84	11.19	26	3.33
T_{17} (P_2N_3)	130	16.10	80	10.62	24	3.07
T_{18} (P_2N_4)	197	25.75	109	15.23	30	4.06
T_{19} (P_2N_5)	171	21.65	105	14.12	29	3.77
T_{20} (P_2N_6)	177	22.65	107	14.44	29	3.80
T_{21} (P_2N_7)	155	19.28	91	12.25	27	3.50
T_{22} (P_3N_1)	107	15.06	59	9.13	16	2.36
T_{23} (P_3N_2)	97	13.23	49	7.29	14	2.03
T_{24} (P_3N_3)	83	10.95	46	6.81	9	1.28
T_{25} (P_3N_4)	126	19.48	77	13.05	23	3.65
T_{26} (P_3N_5)	112	16.14	65	10.53	20	3.1
T_{27} (P_3N_6)	124	18.80	70	11.57	22	3.48
T_{28} (P_3N_7)	111	15.95	59	9.49	17	2.58
SEm (±)	**2.98**	**0.50**	**2.46**	**0.37**	**2.35**	**0.32**
LSD(P≤0.05)	**8.46**	**1.42**	**NS**	**NS**	**6.66**	**0.90**

The interaction effect between pruning and nutrient revealed fruit yield was significantly different in Ambe and Hasth bahar, whereas it was statistically at par in Mrig bahar. T_{11}

(P_1N_4) gave the maximum fruit yield (35.17 kg/plant, 20.86 kg/plant and 8.07 kg/plant) at Ambe, Mrig and Hasth bahar followed by T_{13} (P_1N_6) (33.85 kg/plant, 19.78 kg/plant and 7.03 kg/plant), whereas minimum fruit yield was recorded (8.86 kg/plant, 4.25 kg/plant and 0.92 kg/plant) in T_3 (P_0N_3) at three seasons respectively. It might be because of more open tree canopy with wider leaf area resulted allowing more light penetration that led assimilation more photosynthetic materials which increased the number of laterals, leaf area, number of spurs, flower bud, fruit set and size, thus increasing total yield and also less competition for the growth of individual fruit as compared to unpruned trees (Kumar *et al.,* 2014). NPK in association of biofertilizer, VAM and Vermicompost at desired amount enhanced leaf chlorophyll content resulting in accumulation of more photosynthates, ultimately resulted in higher yield (Yadav *et al.,* 2011 and Kundu *et al.,* 2011). Similar result also found in lemon cv. Pant Lemon-1 (Mishra *et al.*, 2011).

In conclusion, the present results suggest that integrated application of inorganic fertilizers, organic and biological sources of nutrients in an efficient way would not only reduce the sole dependence on inorganic fertilizers but also influence the flowering-fruiting in lemon. Besides, pruning has also significant effect in fruit yield. Among several levels pruning and nutrients application, light pruning (25 cm pruning from the terminal portion of the shoot) along with integrated use of fertilizers viz. 75% RDF +Vermicompost + *Azotobacter* + Vesicular Arbuscular Mycorrhiza proved as best in terms of quality lemon production for this region.

Acknowledgements

Authors are grateful to Prof. S. K. Ghosh, Head, Department of Pomology and Post Harvest Technology for providing guidance and financial support during research.

References

Gomez, K.A. and Gomez, A.A. 1983. Problem data. In: Statistical procedures for Agricultural Research (2nd edition), Wiley-Inter science Publication (John Wiley and Sons); New York, USA, pp 275-315.

Iglesias, D.J., Cercos, M., Colmenero-Flores, J.M., Naranjo, M.A., Rios, G., Carrera, E., Ruiz-Rivero, O., Lliso, I., Morillon, R., Tadeo, F. R., Talon, M. 2007. Physiology of citrus fruiting. *Br. J. Plant Physiol*., 19(4): 333-362.

Khehra, S. and Bal, J.S. 2014. Influence of organic and inorganic nutrient sources on growth of lemon (*Citrus limon* Burm.) Cv. Baramasi. *J. Exp. Biol. and Agric. Sci*., 2(1S): 126-129.

Kumar, H., Katiyar, P.N., Singh, A.K., Rajkumar, B.V. 2014. Effect of different pruning severity on growth and yield of ber (*Zizyphus mauritiana* Lamk), cv. Banarsi Karaka. *Int. J. Curr. Microbiol. and Appl. Sci*., 3(5): 935-940.

Kundu, S., Datta, P., Mishra, J., Rashmi, K. and Ghosh, B. 2011. Influence of biofertilizer and inorganic fertilizer in pruned mango orchard cv. Amrapali. *J. Crop and Weed*, 7(2): 100-103.

Mishra, N.K., Mishra, K.K., La, R.L., Mishra, D.S. and Goswami, A.K. 2011. Influence of integrated use of organic and inorganic source of nutrient on productivity and quality of lemon (*Citrus limon* Burm.) cv. Pant Lemon-1 under terai condition of Uttrakhand. *The Hort. J*., 24(2): 67-69.

Nath, J.C. and Baruah, K. 1999. Regulation of flowering time, plant growth and yield in Assam Lemon (*Citrus limon*) with the help of pruning and growth regulators. *Indian J. Agric. Sci*., 69(4): 292-294.

Shaban, A.E.A. and Haseeb, G.M.M. 2009.

Effect of pruning severity and spraying some chemical substances on growth and fruiting of guava Trees. *Am. Eur. J. Agri. and Env. Sci*., 5(6): 825-831.

Singh, G. and Dhaliwal, G.S. 2004. Effect of different pruning levels on fruit yield and quality of guava (*Psidium guajava* L.) cv. Sardar. *Haryana J. Hort. Sci*., 33(1/2): 83-84.

Singh, J.K., Singh, D.K., Prasad, J. and Singh, H.K. 2009. Studies on integrated nutrient management on flowering behaviour of bael (*Aegle mermelos* Correa.) cv. Narendra bael.

Singh, R. and Saxena, S.K. 2008. In: Fruits, National Book Trust, India, A-5 Green Park, New Delhi – 110016. pp. 91.

Yadav, A.K., Singh, J.K., Singh, H.K. 2011. Studies on integrated nutrient management in flowering, fruiting, yield and quality of mango cv. Amrapali under high density orcharding. *Indian J. Hort.,* 68(4): 453-460.

How to cite this article:

Ghosh, A., K. Dey, N. Bhowmick, P.S. Medda, A.N. Dey and Ghosh, A. 2017. Reproductive Behaviour of Lemon (*Citrus limon* Burm.) Affected by Different Pruning Intensities and Integrated Nutrient Management under Various Growing Season. *Int.J.Curr.Microbiol.App.Sci.* 6(4): 606-614. doi: https://doi.org/10.20546/ijcmas.2017.604.073