J. Agrofor. Environ. 2(1): 1-6, 2008 ISSN 1995-6983

Effect of different sources of nutrients and irrigation on the fruiting behaviour and yield of litchi

L. Akter, M.M. Hossain[1], M.N.N. Mazumder[2], F. Ahmed[3] and M. A. Rahim[4]
Bangladesh Agricultural Development Corporation, Mymensingh, [1]Deptartment of Agronomy, BAU, Mymensingh, [2]Planning and Development Cell, BINA., [3]Academic Section, BAU, Mymensingh and [4]Department of Horticulture, BAU, Mymensingh

Abstract: The present study was conducted at Germplasm Centre (GPC) of Fruit Tree Improvement Project (FTIP), Department of Horticulture, Bangladesh Agricultural University, Mymensingh during the period of January-July, 2004 to study the effect of different sources of nutrients and irrigation on the yield of Litchi (cv. Mongalbari). The study consisted of two factors namely (a) Different sources of nutrient as (i) Recommended fertilizer (NPK) (ii) Well decomposed cowdung (WDCD) (iii) Poultry manure (iv) Compost (v) Control; (b) Irrigation at different intervals as (i) 7 days intervals (ii) 14 days intervals (iii) 21 days intervals and (iv) Control. The experiment was laid out in Split plot design with three replications. Results revealed that almost all parameters were influenced by different nutrient sources and irrigation. Number of inflorescences per plant, number of fruit set per plant at three times (i) pea stage (ii) marbel stage (iii) mature stage, weight of individual fruit, length of fruit, fruit diameter, skin weight, length of seed, Total Soluble Solids (TSS) were found superior in plants fertilized by different sources of nutrient and irrigation. Seed to pulp ratio was higher (6.28) in controlled plant and medium (4.85) in fertilized plant. The highest yield (10.35 kg) was observed when plants were fertilized by NPK and irrigation was given at 7 days intervals. The fruits of control plants had the lowest Total Soluble Solids (TSS). Considering all the above factors, fertilization by NPK and irrigation at 7 days interval are very effective for increasing yield of litchi.

Key words: Nutrients, irrigation, fruiting behaviour, yield

Introduction

Litchi is a popular fruit of Bangladesh and its cultivation is mainly concentrated in Dinajpurr, Rajshahi, Rangpur, Kushtia, Khulna, Jessore, Mymensingh, Dhaka, Sylhet and Chittagong districts. According to BBS (2003), Bangladesh produces 14 thousand tones of litchi per annum from 14.68 thousand hectares of land. The production of litchi largely depends on different management practices including nutrient management, irrigation etc. In Bangladesh there is a great possibility of increasing litchi yield per unit area with proper use of fertilizer. Fertilizers specially nitrogenous, phosphorus and potassic are the most critical input for increasing crop production. The deficiency of different nutrients depressed plant growth and flowering while applications of different nutrients (specially NPK) were found to promote growth, flowering and yield of litchi (Bose, 1985).

Another important factor is soil moisture that influences the growth, development and yield of litchi. Adequate and frequent irrigation is also essential for the bearing litchi trees. Flowers and young fruits shed unless irrigation is maintained at maximum rates to prevent stress condition (Menzel and Simpson, 1986). Frequent irrigation during critical period of aril growth (T.K. Bose, 1985) reduced the incidence of fruit cracking. Considering all these factors, the present study was undertaken to determine the effect of sources of nutrient and irrigation on fruiting behaviour and yield of litchi cv. Mongolbari.

Materials and Methods

A field experiment was conducted at Germplasm Centre (GPC) of Fruit Tree Improvement Project (FTIP), Department of Horticulture, Bangladesh Agricultural University, Mymensingh during the period from January to July 2004 to evaluate the effect of different sources of nutrient and irrigation on the fruiting behaviours, yield and quality of litchi. Five years old litchi plants (CV.Mongolbari) were selected as experiment materials for the experiment. Mongalbari variety is cultivated mainly in Mymenshing region. Its seed size is large and pulp is sweet. Weeding was done whenever required. No pesticide was used in the test plants.

The experiment comprised two factors namely (A) Sources of nutrient as (i) Recommended chemical fertilizer (NPK@ 0.5, 1.50 and 1.0 kg plant^{-1}) (ii) Compost @ 100 kg plant^{-1} (iii) Well decomposed cowdung (WDCD@ 100 kg plant^{-1}) (iv). Poultry manure @ 50 kg plant^{-1} (v) Control (No fertilizer) (B) Different irrigation intervals (i) 7 days; (ii) 14 days (iii) 21 days and (iv) control (No irrigation). The experiment was laid out in the split plot design having three replications with irrigationin in main plot and nutrient source in sub-plot. Thus there were all together 20 treatment combinations. Observation were made on yield contributing traits such as number of inflorescence per plant, number of fruit set per plant (at three times a. pea stage b. marble stage c. mature stage), individual fruit weight, fruit length, diameter of fruit, weight of skin, pulp weight, weight of seed, seed length, Total Soluable Solids (TSS), seed to pulp ratio and yield per tree. Data were analyzed statistically by using the computer package MSTAT. Differences among the means were evaluated by the Least Significant Difference (LSD) test.

Results and Discussions

Effect of sources of nutrients

Different sources of nutrient had significant effect on all yield related characters like fruit weight, fruit diameter, fruit skin weight, fruit pulp weight, seed weight, seed length, yield, total soluble sugar, seed: pulp except fruit length. In the respect of nutrient, the highest fruit weight (17.57g), fruit diameter (2.94cm), fruit pulp weight (13.02g), seed: pulp (4.85) were

produced by well decomposed cowdung but the highest fruit skin weight (2.89g), seed weight (3.43g), seed length (2.79cm), yield (7.099kg/plant) and total soluble sugar were produced by recommended fertilizer (NPK). The lowest fruit weight (14.72g), fruit diameter (2.62cm), pulp weight (8.11g), seed: pulp (2.45) was obtained from recommended fertilizer (NPK) but the lowest seed weight (1.48g), seed length (1.71cm), yield (1.95kg/plant), total soluble sugar (11.82) were produced by control (no fertilizer) and skin weight (2.07) by poultry manure (Table 1).

Table 1 Effect of different sources of nutrients on yield and quality of litchi

Nutrient	Wt. of single (g)	Length of single fruit (cm)	Diameter of single fruit (cm)	Wt. of single skin (g)	Wt. of single l pulp (g)	Wt. of single seed (g)	Length of single seed (cm)	Yield (kg/ plant)	Total soluble sugar	Seed: Pulp
F_1	14.72	3.60	2.62	2.89	8.11	3.43	2.79	7.099	16.02	2.45
F_2	17.57	3.87	2.94	2.86	13.02	2.70	2.40	2.71	15.51	4.85
F_3	16.60	3.67	2.66	2.72	11.30	2.58	2.23	2.13	12.68	4.37
F_4	16.48	3.81	2.73	2.07	11.39	3.02	2.24	2.42	13.79	3.78
F_5	14.82	3.66	2.78	2.35	10.99	1.48	1.71	1.95	11.82	6.28
LSD (0.01)	0.8406	0.7495	0.3898	0.4488	0.3089	0.4327	0.4203	0.57	0.7280	0.9131

F_1 = NPK; F_2 = WDCD; F_3 = Compost; F_4 = poultry manure; F_5 = Control

Effect of irrigation

The results showed that seed weight, yield, seed: pulp were significantly affected by different irrigation intervals but fruit weight, fruit length, fruit diameter, skin weight, pulp weight, seed length, total soluble sugar were found unaffected. The highest fruit weight (16.12), diameter (2.78), pulp, weight (11.17) were apparently produced by control (no irrigation) and lowest fruit weight (15.94), diameter (2.69), pulp weight (10.66) were produced by irrigation at 7 days interval. Highest fruit length (3.77) was produced by irrigation at 21 days interval and lowest one (3.66) was produced by irrigation at 7 days interval. The applied irrigation at 7 days interval produced the highest skin weight (2.47) and 21 days interval produced the lowest one (2.30).

Table 2 Effect of irrigation on yield and quality of litchi

Irrigation	Wt. of single fruit (g)	Length of single fruit (cm)	Diameter of single fruit (cm)	Wt. of single skin (g)	Wt. of single pulp (g)	Wt. of single seed (g)	Length of single seed (cm)	Yield (kg/ plant)	Total soluble sugar	Seed Pulp
I_7 (i_1)	15.94	3.66	2.69	S2.47	10.66	2.81	2.29	5.87	14.03	3.76
I_{14} (i_2)	16.00	3.77	2.77	2.39	10.91	2.70	2.21	0.89	13.97	3.88
I_{21} (i_3)	16.08	3.77	2.74	2.35	11.09	2.41	2.40	2.65	13.93	4.93
Control (i_4)	16.12	3.69	2.78	2.30	11.17	2.64	2.19	3.64	13.92	4.80
LSD (0.01)	1.720	1.036	0.482	0.485	1.445	0.486	0.482	0.562	1.482	0.596

I_7 = Irrigation at 7 days interval; I_{14} = Irrigation at 14 days interval; I_{21} = Irrigation at 21 days interval

Effect of interaction

The effect of different treatments was significant in diameter of fruit but non-significant in length of fruit. Highest diameter (2.99) was found when plants were fertilized by Well Decomposed Cowdung (WDCD) and irrigated at 21 days intervals and highest length (3.96) was observed when plants were fertilized by poultry manure (PM) and irrigation was applied at 7 day intervals.

Different time of fertilization and irrigation exhibited mark influence on individual fruit weight and fruit yield of Litchi. The maximum individual fruit weight (17.68) was found when plants were fertilized by Well Decomposed Cowdung (WDCD) and irrigation at 21 days interval but total yield was highest (10.35) when plants were fertilized by recommended fertilizer (NPK) and irrigation at 7 day intervals.

Weight of skin and weight of pulp were also influenced by different treatments. Highest skin weight (2.96) was fund when plants were fertilized by recommended fertilizer (NPK) and irrigation at 14 days interval and maximum pulp weight (13.28) when plants were fertilized by Well Decomposed Cowdung (WDCD) and irrigation at 21 day intervals.

Different sources of nutrient and irrigation showed mark influence on individual seed weight and length. Highest seed weight (3.79) was noticed when plants were fertilized by recommended fertilizer (NPK) and irrigation at 14 days interval and highest length (3.63) was observed when plants were fertilized by recommended fertilizer (NPK) and irrigation at 21 day intervals.

Seed to pulp ratio was significantly influenced by different sources of nutrient and irrigation. Highest seed to pulp ratio (8.30) was found in controlled plant

lowest (2.01) seed to pulp ratio when plants were fertilized by recommended fertilizer (NPK). Total Soluble Solids (TSS) was non-significantly influenced by different sources of nutrient and irrigation. Highest Total Soluble Solids (TSS) (16.24) was found when plants were fertilized by recommended fertilizer (NPK) and irrigation at 7 day intervals. (Table3)

Table 3 Combined effect of different sources of nutrients and irrigations on yield and quality of litchi

Irrigation	Wt. of single fruit (g)	Length of single fruit (cm)	Diameter of single fruit (cm)	Wt. of single skin (g)	Wt. of single pulp (g)	Wt. of single seed (g)	Length of single seed (cm)	Yield (kg/ plant)	Total soluble sugar	Seed Pulp
F_1I_1	14.97	3.56	2.84	2.23	11.37	2.76	1.49	10.35	16.24	2.20
F_1I_2	14.87	3.76	2.71	2.96	7.90	3.79	1.59	0.25	11.91	2.01
F_1I_3	14.79	3.67	2.79	2.31	11.00	1.48	3.63	1.66	11.89	4.30
F_1I_4	14.69	3.47	2.77	2.57	10.45	1.62	1.98	4.85	15.93	4.50
F_2I_1	17.63	3.87	2.95	2.83	13.19	2.61	2.37	2.45	15.52	5.10
F_2I_2	17.51	3.89	2.93	1.89	12.92	2.59	2.36	1.56	15.33	5.10
F_2I_3	17.68	3.89	2.99	1.81	13.28	2.69	2.39	2.52	15.56	4.80
F_3I_4	17.46	3.84	2.90	1.91	12.66	2.89	2.47	4.31	15.64	4.40
F_3I_1	16.71	3.59	2.71	2.60	11.60	2.51	2.23	3.62	12.51	4.60
F_3I_2	16.63	3.70	2.65	2.69	11.38	2.56	2.19	0.008	12.69	4.47
F_3I_3	16.58	3.71	2.63	2.77	11.22	2.59	2.23	0.52	12.70	4.30
F_3I_4	16.46	3.66	2.66	2.82	10.98	2.66	2.27	4.37	12.80	4.10
F_4I_1	16.59	3.96	2.37	2.09	11.47	3.02	2.34	1.77	13.65	3.80
F_4I_2	16.51	3.91	2.78	0.04	11.47	3.00	2.23	2.39	13.79	3.80
F_4I_3	16.49	3.87	2.87	2.00	11.52	2.97	2.16	0.69	13.74	3.90
F_4I_4	16.33	3.49	2.88	2.14	11.09	3.10	2.23	5.46	13.99	3.60
F_5I_1	14.64	3.62	2.51	2.76	8.24	3.69	2.51	9.33	11.48	2.20
F_5I_2	14.72	3.57	2.59	2.92	8.17	2.49	1.78	8.55	15.91	3.30
F_5I_3	14.65	3.69	2.63	2.29	11.15	1.43	2.51	0.17	15.98	8.00
F_5I_4	14.83	3.67	2.74	2.93	8.14	1.37	1.48	1.05	11.99	8.30
LSD (0.01)	1.810	1.091	0.505	0.512	1.521	0.512	0.507	0.591	1.560	0.627

F_1 = NPK; F_2 = WDCD; F_3 = Compost; F_4 = poultry manure; F_5 = Control
I_7 = Irrigation at 7 days interval; I_{14} = Irrigation at 14 days interval; I_{21} = Irrigation at 21 days interval; I_4 = Control

Conclusion

From the findings of the present investigation the following conclusion may drawn-yield of litchi is greatly influenced by different sources of nutrient and irrigation.Recommended fertilizer (NPK) and irrigation at 7 days interval provides favorable conditions for growth and development of fruit leading to better yield of litchi and for the efficient use of recommended fertilizer and irrigation should be given as soon as possible after fertilization so that fertilizer can easily be solubilized for plants.

References

BBS, 2003. Year book of Agricultural Statistics Bangladesh, Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Govt. of the peoples Republic of Bangladesh, Dhaka. pp. 86-87.

Bose, T. K. 1985. Fruits of India: Tropical and subtropical. Naya Prokash, India, p. 545.

Menzel. C. M. and Simpson, D. R.1986. Lyche Cultivars. Queensland Agril. J., 112 (3): 125-136.