Indian Journal of Agronomy **50** (1) : 80–82 (March 2005)

Determination of optimum fertilizer and spacing requirement for sustaining higher growth and fibre yield of Indian ramie (*Boehmeria nivea)*

SITANGSHU SARKAR[1]

Ramie Research Station, Central Research Institute for Jute and Allied Fibres, Sorbhog, Barpeta, Assam 781 317

Received : May 2003

ABSTRACT

A field experiment was conducted during 1997–2000 on medium fertile, sandy–loam acidic soil of Ramie Research station, Sorbhog, Assam, to study the effect of fertilizer and spacing on growth and fibre yield of ramie [*Boehmeria nivea* (L.) Gaud.] cv. 'R 1411'. Total 14 cuttings could be taken in the order of 2,5, 4 and 3 cuttings in the 1st, 2nd, 3rd and 4th year respectively. The highest fibre yield of 164 to 650 kg/ha/cutting was recorded with 40:20:20 kg NPK/ha/cutting of whereas the lowest spacing, i.e. 20 cm x 40 cm resulted in the highest fibre yield/ cutting ranging between 172 and 654 kg/ha/cutting, may be due to accommodation of higher cane numbers per unit area. Interaction of fertilizer and spacing showed that 40:20:20 kg/ha/cutting of NPK along with 20 cm x 40 cm spacing resulted in the highest fibre yield per cutting (184-690 kg/ha/cutting) which was at par with fibre yield (179–687 kg/ha/cutting) obtained with 30:15:15 kg/ha/cutting of NPK with 20 cm x 40 cm spacing. Second year of the plantation provided the highest total fibre yield of 2,469 kg/ha with 40:20:20 kg/ha of NPK along with 20 cm x 40 cm spacing. Regarding the cutting-wise fibre yield, it was observed that 2 cutting (July) gave the highest fibre yield (597kg/ha/cutting) followed by 3rd, 1st and 4 cutting in descending order.

Key words : Ramie, NPK fertiliser, Spacing, Growth, Fibre yield

The finest, longest, strongest and exceptionally white lustrous textile fibre of plant origin is available from the bast portion of ramie [*Boehmeria nivea* (L.) Gaud.]. At present, ramie is cultivated only in restricted areas of north-eastern India. This fibre crop has tremendous scope of extensive cultivation in the vast north-eastern India and northern districts of West Bengal and if so happens it may uplift the poor economic condition of the farmers (Sarkar and Maitra, 2001). In spite of such mammoth potentiality of ramie, it is not emerging as a principal cash crop of this region only due to some temporary hindrances, of which non-availability of sound production technology specific to the agro-ecological situations of this region is the main factor. Decades ago, some scattered works had been done in India for the development of different aspects of ramie production technology including fertilization and spacing requirement. Among the Indian works on this fibre crop, only a few had given emphasis on fertilization and spacing experiment of Indian remie cultivars (Sarma *et al.*, 1983; Singh, 1994) and the findings so obtained are not conclusive. Therefore, an attempt was made to find out the amount of fertilizers needed along with the spacing requirement in the typical edapho-climatic conditions of north -eastern part of India for sustaining higher fibre yield of Indian ramie cultivar, 'R 1411'

MATERIALS AND METHODS

The field experiment was conducted for 4 years (1997 to 2000) at Ramie Research Station (26.5°N, 91°E, 90 m above mean sea-level), a sub-station of the Central Research Institute for Jute and Allied Fibres (ICAR), Sorbhog, Assam. The sandy-loam soil was acidic (pH 5.35) and high in organic carbon (1.26%). It was medium in fertility in respect to available N (368 kg/ha) and P (24 kg/ha) and low in available K (63 kg/ha). The experiment was laid out in split-plot design with 9 treatment combinations, comprising 3 levels of fertilizers (N, P_2O_5 and K_2O at 20, 10 and 10 kg/ha (F_1), 30 15 and 15 kg/ha (F_2) and 40, 20 and 20 kg/ha (F_3) kg/ha/cutting) in the main plot and 3 levels of spacing (S_1: 20 × 40 cm; S_2: 30 cm × 60 cm; and S_3: 40 cm × 80 cm) in the subplot replicated thrice. Calculated amount of N as urea, P as single superphosphate and K as muriate of potash were applied after each cutting. Size of each sub-plot of this experiment was 6 m × 4 m. The ramie cultivar used was 'R 1411', which produces the finest fibre among all the available Indian

***Present address :** [1]Agronomy Division, Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata, West Bengal 700 120

ramic cultivars. In 1997, rhizome pieces of 15 cm length were planted in the first week of May and staging back (removal of initial unequal above ground growth from the planted rhizomes for getting subsequent uniform growth) was done in July. So, in the 1st year of the experiment only 2 cuttings were available before the onset of winter. From 2nd year onwards as usual number of cuttings was obtained. Plant height was taken at harvest and fibre yield was recorded after decortication, washing and sun drying.

RESULTS AND DISCUSSION

In 1997, after proper crop establishment and staging back only 2 cuttings could be taken. In 1998, five cuttings could be taken due to proper crop establishment with developed root system. Four and three cuttings were possible in the 3rd and 4th production year respectively.

The highest plant height was 89, 112, 109 and 97 cm for 1st, 2nd, 3rd and 4th cuttings, respectively, with a fertilizer dose of 30, 15, 15 kg/ha/cutting N, P_2O_5, K_2O (hereafter denoted by NPK) and with a spacing of 20 cm × 40 cm.

Fertilizers

Cutting-wise dry fibre yield differed significantly with different levels of fertilizers (Table 1). It was observed that in all 14 cuttings in total, the highest dry fibre yield were recorded with the highest fertiliser dose (F_3), i.e. 40, 20 and 20 kg N, P and K/ha/cutting. The minimum dry fibre yields were recorded with the lowest doses of fertilisers, i.e. 20, 10 and 10 kg N, P and K/ha/cutting. The earlier work reported that either 60, 30, 60 kg NPK/ha/cutting (Sharma and Ghosh, 1981) or 60, 30, 30 kg/ha/cutting (Sharma *et al.*, 1983) or 30, 15, 60 kg/ha/cutting (Singh, 1994) are optimum for higher fibre production in ramie.

Spacing

Cutting-wise dry fibre yield differed significantly with different levels of spacing (Table 1). In all the 14 cuttings, the highest dry fibre yields were recorded in the minimum spacing (20 cm × 40 cm). The present finding is in contrast with the earlier report of Sarma *et al* (1983) where it was observed that 30 cm × 60 cm spacing was optimum for higher fibre yield in ramie.

Interaction of fertilizer and spacing

Dry fibre yield of ramie differed significantly with different combinations of fertilizer and spacing (Table 2). In the initiation year of the experimental plantation, 40, 20 and 20 kg N, P and K/ha/cutting along with 20 cm × 40 cm spacing produced the highest fibre yields of 272 and 184 kg/ha/cutting from and first second cutting, respectively, which were at par with the fibre yields obtained from 30, 15 and 15 kg/ha of N, P and K + 20 cm × 40 cm spacing. Five cuttings of 1998 (2nd year) also showed the same pattern of yields as of previous year. The highest fibre yields were recorded with 40, 20 and 20 kg/ha of N, P and K along with 20 cm × 40 cm spacing which were at par with fibre yields obtained with 30, 15 and 15 kg/ha of N, P and K in combination with 20 cm × 40 cm spacing. In the 3rd year, 4 cuttings were obtained and the highest fibre yields were 519, 690, 656 and 401 kg/ha/cutting with 40, 20 and 20 kg of N, P and K + 20 cm × 40 cm spacing, which were closely followed by the fibre yields obtained with 30, 15 and 15 kg/ha of NPK along with 20 cm × 40 cm spacing. In the concluding year of the experiment when the plantation was 4 years old, the highest fibre yields for the 2nd and 3rd cuttings were obtained with 40 and 20 kg of N, P and K along with 40 cm × 80 cm spacing, which is not similar in trend with the yields of first 3 years. With the ageing of the plantation, higher spacing

Table 1. Cutting-wise dry fibre yield of ramie as influenced by levels of fertilizers and spacing

	Cutting-wise dry fibre yield (kg/ha/cutting)													
	1997		1998					1999				20000		
	I	II	I	II	III	IV	V	I	II	III	IV	I	II	III
Fertilizer (kg/ha)														
F_1	180	124	351	431	385	346	187	370	506	522	284	253	411	163
F_2	241	147	438	467	541	409	237	443	634	617	318	253	507	293
F_3	254	164	555	494	574	452	254	481	650	634	339	277	553	286
CD (P=0.05)	4	2	10	8	6	8	7	4	3	4	4	5	5	6
Spacing														
S_1	251	172	526	498	561	445	275	490	654	633	373	335	526	251
S_2	224	136	398	411	471	396	224	409	566	565	280	240	464	244
S_3	201	127	419	484	468	366	207	396	569	576	288	207	481	247
CD (P=0.05)	7	9	11	7	8	7	8	6	6	5	4	5	6	7

Details of fertilizers and spacing are given in text

Table 2. Interaction effect of fertilizer and spacing on the cutting-wise dry fibre yield in ramie

Treatment	Cutting-wise dry fibre yield (kg/ha/cutting)													
	1997		1998					1999				2000		
	I	II	I	II	III	IV	V	I	II	III	IV	I	II	III
F_1S_1	210	152	433	443	433	408	209	438	587	603	338	325	437	181
F_1S_2	198	115	296	391	387	326	188	334	456	474	268	228	387	135
F_1S_3	133	105	323	460	336	303	164	339	476	490	248	206	410	172
F_2S_1	269	179	561	521	618	462	265	515	687	639	381	348	573	323
F_2S_2	234	143	368	398	497	427	239	439	616	598	279	217	538	314
F_2S_3	220	120	386	473	507	337	206	377	600	615	294	119	410	243
F_3S_1	272	184	584	531	631	464	268	519	690	656	401	331	569	250
F_3S_2	240	151	531	443	530	436	343	453	628	622	294	276	467	282
F_3S_3	250	156	550	519	562	457	251	472	632	625	323	247	624	326
CD (P=0.05)	13	15	18	13	14	11	15	10	11	9	7	9	11	12

Details of fertilizers (F) and spacing are given in text

Table 3. Interaction effect of fertilizer and spacing on the yearly total fibre yield and cutting-wise fibre yield

Treatment	Year-wise total fibre yield (kg/ha)				Cutting-wise fibre yield (kg/ha)			
	1997	1998	1999	2000	I	II	III	IV
F_1S_1	362	1925	1965	943	399	489	357	299
F_1S_2	313	1,588	1,531	749	286	411	298	236
F_1S_3	237	1586	1553	787	289	449	283	218
F_2S_1	448	2437	2221	1244	475	597	462	341
F_2S_2	377	1929	1933	1069	342	518	411	283
F_2S_3	340	1908	1885	845	318	494	396	250
F_3S_1	456	2,469	2266	1151	478	593	453	350
F_3S_2	391	2184	1996	1025	420	513	418	294
F_3S_3	406	2338	2051	1197	423	591	441	312
CD (P=0.05)	23.5	59.6	8.9	28.8	10.8	4.3	10.2	8.5

Details of fertilizers (F) and spacing (S) are given in text

may have beneficial effect on the fibre yield from older plantation through accommodation of more number of canes and drawing of adequate nutrients from a wide area of spacious plantation.

Total fibre yield

The yearly total fibre yield was the highest in the 2nd year of the plantation (2,469 kg/ha) with 40, 20 and 20 kg/ha of N, P and K along with 20 cm × 40 cm spacing which was followed by the total fibre yields of 3rd, 4th and 1st year of the experiment in the descending order (Table 3). In all the 4 years, the highest fibre yield was closely followed by the fibre yields obtained with 30, 15 and 15 kg/ha of N, P and K in combination with 20 cm × 40 cm spacing.

Fibre yield/cutting

The highest fibre yield/cutting (597 kg/ha) was from 2nd cutting (i.e. July cutting) with 30, 15 and 15 kg/ha of N, P and K along with 20 cm × 40 cm spacing which was followed by the fibre yields from 3rd (September), 1st (May) and 4th (November) cutting of the plantation in a year (Table 3).

It may be concluded that fertilization of 30, 15 and 15 kg of N, P_2O_5 and K_2O/ha/cutting and followed by 20 cm × 40 cm spacing for planting of ramie rhizome is better for sustaining higher fibre production in Indian ramie cultivar.

REFERENCES

Sarkar, Sitangshu and Maitra, D.N. 2001. Production technology of ramie. *Indian Farmer's Digest* **34**(1) : 21–24.

Sarma, B.K. and Ghosh, K. 1981. Effect of N, P and K on the fibre yield of ramie. *Journal of the Assam Science Society* **24**(2) : 22–25.

Sarma, B.K., Biswas, G.C., Jana, A.K. and Ghosh, K. 1983. Fibre yield of ramie as affected by plant spacing and fertilisers level. *Jute Development Journal* **3**(2) : 28–30.

Singh, D.P. 1994. Effect of NPK fertilization on fibre and rhizome yield in ramie under subtropical conditions. *Bangladesh Journal of Jute and Fibre Research* **19**(2) : 83–86.