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Studies on Roselle (*Hibiscus sabdariffa* var. *altissima* L.) Cultivation in Thailand

III. Effect of row spacing on fiber yield at a definite population density

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In Thailand roselle is sown by three methods, broadcasting, hole planting and row planting. In broadcasting seeds are simply scattered over a field. In hole planting usually 4 to 10 seeds are drilled per hole, while in row planting seeds are drilled along the shallow ditches 30—50 cm apart and within a row spacing of 5—10 cm. In order to decide which method is to be adopted, not only yield but also the cost and ease of management, such as pesticide spraying and weeding, should be taken into consideration. As for fiber yield, there are two interrelated aspects involved : the effect of population density itself and the effect of row spacing at a given population density. However, in the few reports so far made public, both aspects are mixedly dealt with. For example, the best yield of *H. sabdariffa* var. *altissima* is reported to have been obtained in India at 22.5×15 cm spacing with a population of 252,000 plants per hectare, while in Thailand it is at 30×10 cm spacing with a population of 331,000 plants per hectare and in Georgia, U.S.A., with a population of 262,000 plants per hectare[1].

As for the density problem, the quality of seeds is concerned first, because good seeds with a high percentage germination will give a high density population, while poor seeds will give a low density one. In addition, soil, climate and other environmental conditions will give more complex effects on this problem.

On the other hand, it is well known in many crops that row spacing can give considerable effect on their yield. In roselle, however, information on this aspect is rather fragmental.

Thus, a field experiment was carried out at several locations in relation to the optimum row spacing at a given population density.

Materials and Methods

The experimentation was designed in a randomized complete block with five replications, and conducted at the four experiment stations whose geophysical, soil and climatic conditions are already described in Table 1 of the second paper of this series[3].

Seven different spacings between rows from 20 cm to 80 cm were taken by using main plots of 49×17.9 m and subplots of 9×1.7 m. Plants were grown at a fixed rate of 41.6 plants/m^2 by changing the row spacing in combination with the distance within the row. Chemical fertilizer with formular of 25-25-25 kg/ha for N, P_2O_5 and K_2O was applied before seeding. Ton-Kiew variety was used. Crop harvesting was done in the middle rows with an area of 8.64 m^2.

Results and Discussion

Changes in the fiber yield at the four stations in relation to row spacing are shown in Table 1. The yield variations are also plotted into a graph in Fig. 1 taking row spacing at the horizontal axis.

In the table the average yields for all the four stations are calculated and shown in the figure by a chained line at the middle. From this line it may seem that row spacing does not have any significant effect on fiber yield.

However, if the yields at individual stations are compared, it will be noticed that there are large differences in the yield level among the four stations : at Khon Kaen and Mahasarakam it is very high and at Ubolrathani and Nonsoong it is very low. It will be further noticed that within each group the response of yield to row spacing is more or less similar

Table 1. Fiber yield of roselle grown at different row spacings with a definite planting density.

kg/a

Spacing cm	Low yield stations			High yield stations			All aver.
	Ubol-rathani	Non-soong	Aver.	Khon Kaen	Mahasa-rakam	Aver.	
20×12	21.5	16.7	19.1 (92)	45.1	44.8	45.0 (99)	32.0
30× 8	29.8	23.1	26.5 (127)	44.9	46.4	45.7 (101)	36.1
40× 6	15.1	17.1	16.1 (77)	45.4	60.0	52.7 (116)	34.4
48× 5	23.8	13.3	18.6 (89)	47.5	51.8	49.7 (109)	34.1
60× 4	21.3	20.0	20.7 (100)	41.6	51.7	46.6 (103)	33.7
72×3.33	25.1	19.6	22.4 (108)	44.1	37.9	41.0 (90)	31.7
80× 3	21.5	23.4	22.5 (108)	38.3	36.9	37.6 (83)	30.0
Mean	22.6	19.0	20.8 (100)	43.8	47.1	45.4 (100)	33.1

between the two stations, but the response seems to differ between the two groups.

So, in the next step, the yield was averaged for each group separately. The averaged values are shown in the 4th and 7th column in the table, the former representing the low productivity group and the latter, the high productivity group. In the figure they are shown by the two solid lines, upper and lower.

From this figure it will be recognized that, when the productivity is high, the maximum yield is found at 40 cm spacing with a yield of 116% of the mean. The yield decreases irrespective of the direction of the change in spacing, but more conspicuously as it increases to 80 cm spacing where the yield is 83% of the mean. On the other hand, when the productitity is low, it is indicated that a peculiar curve with a meximum, 127% of the mean, at 30 cm spacing, and a minimum, 77% of the mean, at 40 cm spacing. The yield increases with increasing spacing above 40 cm.

Thus, an interesting phenomenon is found, that is, in the range from 40 cm to 80 cm spacing, opposite trends are recognized in relation to the productivity of the station : a decreasing yield under a productive environment and an increasing yield under non-productive environment. Judging from the data on environmental conditions of the stations[3] soil properties rather than rainfall seems to be more heavily responsible for the difference in productivity.

In the case of rice plants, it is generally believed that a higher grain yield is given by square planting when soil productivity is high, but it is given by rectangular planting when soil productivity is low. According to KANDA and KAKIZAKI[2] who conducted an experiment similar to the present one but using rice plants, both grain yield and total dry matter were highest when the ratio of row spacing to hill spacing was 2 : 1 or 3 : 1. In the present experiment the corresponding value is nearly two times higher, 30 : 8 (3.8 : 1), when soil is less productive and 40 : 6 (6.7 : 1) when it is more productive. Both the similarity and the dissimilarity between the two contrasting crops are interesting, although the reason remains to be elucitated.

Summary

Fiber yield of roselle was compared among seven different row spacings from 20 cm to 80 cm keeping a definite population density of 41.6 plants/m² by changing plant spacing within the row, in a field experiment conducted at four locations in the Northeastern region

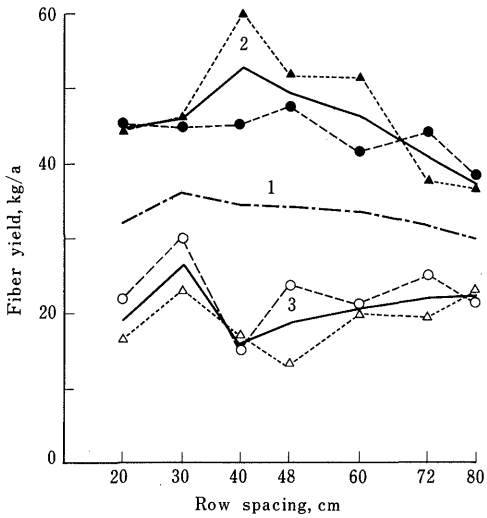

Fig. 1. Dependence of the fiber yield-row spacing relationships on the productivity of location.
● Khon Kaen) productive
▲ Mahasarakam) location.
○ Ubolrathani) less productive
△ Nonsoong) location.
1, Four-station average; 2, average for productive two stations; 3, average for less productive two stations.

of Thailand. The following results were obtained:

No significant difference was recognized in fiber yield in response to row spacing, when all the original data obtained at the four stations were averaged, giving a flat curve with a small maximum at 30 cm spacing.

However, when these data were divided into two groups, those obtained at productive stations and those at less productive ones, the maximum yield was found at 40 cm spacing in the former case while it was found at 30 cm spacing in the latter case.

Further, in the range from 40 cm to 80 cm of spacing, an opposite response was found between the two groups with increasing spacing: the fiber yield decreased at productive locations while it increased at less productive locations. Some similarities and dissimilarities with the case of rice crop were discussed.

References

1. Field Crops Division 1982. Progress of crop improvement. Field Crop Division Report, Dept. of Agric., Bangkok. 27—36.
2. Kanda, N. and Y. Kakizaki 1958. Studies on the spacing density of rice plants. Proc. Crop Sci. Soc., Japan **27**: 177—178.
3. Sermsri, N., C. Duyapat and Y. Murata 1987. Studies on roselle (*Hibiscus sabdariffa* var. *altissima* L.) cultivation in Thailand. II. Effect of planting time, harvesting time and climatic factors on fiber yield. Japan. Jour. Crop Sci. **56**: 64—69.

〔和 文 摘 要〕

タイ国におけるロゼル（*Hibiscus sabdariffa* var. *altissima* L.）の栽培に関する研究

第3報 個体密度一定の場合の繊維収量に対する条間距離の効果

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株間距離と条間距離を組合わせて個体密度を 41.6 個体/m² に一定に保ちつつ，条間距離を 20 cm から 80 cm まで 7 段階に変えて，ロゼルをタイ国東北部の 4 試験場で圃場栽培し，次の結果を得た．

元のデータを 4 試験場で平均した場合の繊維収量は条間距離によってほとんど変動せず，ただ 30 cm 条間区に小さな極大値が見られるだけであった．しかし，生産力の高い 2 試験場とその低い 2 試験場とで別々に平均収量を求めてみると，前者では 40 cm 条間区に極大値が現われるのに対し，後者では 30 cm 条間区に極大値が見られた．

さらに，40 cm から 80 cm まで条間を増した場合，2 グループ間で収量は正反対の反応を示した．すなわち，生産力の高い試験場では条間距離の増大につれて収量が低下したのに対し，生産力の低い試験場では収量が増大した．イネの場合との相似点と相違点が論議された．