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Effect of growing  
conditions on fibre quality

RESEARCH CORPORATION OF THAILAND

in collaboration with

DEPARTMENT OF AGRICULTURE, MINISTRY OF AGRICULTURE  
OFFICE OF THE UNDER-SECRETARY OF STATE, MINISTRY OF AGRICULTURE  
DEPARTMENT OF COMMUNITY DEVELOPMENT, MINISTRY OF INTERIOR  
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UNITED NATIONS ASIAN INSTITUTE FOR ECONOMIC DEVELOPMENT AND PLANNING  
UNITED STATES OPERATIONS MISSIONS TO THAILAND  
KASETSART UNIVERSITY  
THAI JUTE ASSOCIATION

COOPERATIVE RESEARCH PROGRAMME NO. 1  
PRODUCTION, PROCESSING, AND UTILIZATION OF  
KENAF AND ALLIED FIBRES

RESEARCH PROJECT NO. 1/4  
EFFECT OF PLANT VARIETY, GROWING CONDITIONS, AND AGRONOMIC  
FACTORS ON THE YIELD AND QUALITY OF KENAF FIBRE

REPORT NO. 8  
EFFECT OF GROWING CONDITIONS ON FIBRE QUALITY  
OF FIVE THAI KENAF VARIETIES

BY  
PRAPANDH BOONKLINKAJORN

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## F O R E W O R D

Cooperative Research Programme No. 1 involves cooperation between ASRCT and many other agencies as set out on the cover of this report.

The present report involves cooperative work between ASRCT (Plant Sciences Group, TAPI), the Department of Agriculture, Ministry of Agriculture (Non Sung Agricultural Experiment Station and Chaiyaphum Seed Multiplication Station) and the Office of the Under-Secretary of State, Ministry of Agriculture (Northeast Agricultural Center). It is concerned with a study, in association with a variety trial of Thai kenaf varieties, attempting at the examination of the effects of plant variety and growing conditions upon the fibre quality (spinning quality) of the varieties NS 001, NS 002, NS 003, THS 30, and THS 44 at the Non Sung Agricultural Experiment Station (Nakhon Ratchasima), and Northeast Agricultural Center (Khon Kaen).

EFFECT OF GROWING CONDITIONS ON FIBRE QUALITY  
OF FIVE THAI KENAF VARIETIES

By Prapandh Boonklinkajorn\*

SUMMARY

Five Thai kenaf varieties (Hibiscus sabdariffa var. altissima) were grown initially in a series of variety trial at three locations in north-east Thailand in 1970. Fibre samples were taken and measured for their diameter and ballistic strength from which their spinning qualities (k) were calculated. Statistical analysis shows that growing conditions prevailed in that part of the country had no influences on the fibre quality of these varieties (NS 001, NS 002, NS 003, THS 30, and THS 44). Average k values were above 3 which are very acceptable commercially and are comparable to Pakistan jute. Climatic conditions during the growth period are also discussed.

INTRODUCTION

Kirby et al. (1970) reported that kenaf fibres produced from Khon Kaen and Udon Thani were usually better than those from Ubon Ratchathani so far as their fineness was concerned. The fibres decidedly belonged to Hibiscus sabdariffa var. altissima since this species was dominating in these areas.

It is generally accepted that species and variety dominate certain influence on the fineness of bast fibre. Hibiscus cannabinus is superior in this respect to H. sabdariffa var. altissima (Kirby et al. 1970). In addition to the genetic make up, growing conditions such as soil fertility, plant population, maturity as well as retting and washing are believed to play great roles on the fibre fineness (Kirby et al. 1970; Nelson and Allison 1958) and also on the fibre yield (Crandall 1964).

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\*Tropical Agricultural Products Institute, ASRCT.

Studies conducted in Thailand on kenaf fibre properties, i.e., diameter, tensile strength as well as spinning quality are comparatively limited. In 1965, Saluja reported that the knot efficiencies of four grades of Khon Kaen kenaf were conclusively inferior to Pakistan jute.\* Through microbial decomposition, high relative humidity was found to deteriorate the tensile strength of kenaf and jute fibres in storage.† Strength and diameter of fibre samples of 31 kenaf varieties were measured in order to determine their spinning qualities, and three samples proved to be comparable with Pakistan jute.‡ Niyomwan (1968) examined the effect of plant age on the fibre fineness of Thai and Cuban kenaf and found that the older plants gave coarser fibre than the younger ones. An examination on fibre fineness of 164 kenaf samples produced in 11 provinces of north-east Thailand was made by Chomchalow et al. (n.d.), the result of which indicated that the diameter ranged from 33.1 to 45.6  $\mu$ . Out of 164 samples, 46% (76 samples) had diameter less than 40  $\mu$ , and 54% (88 samples) had above 40  $\mu$ . It is, however, noted that most of these studies had not basically gone through statistical analysis.

A more elaborate study on the fibre quality of various kenaf varieties grown in different locations within the same period of time and cultural practices was decidedly essential. The study was conducted at Non Sung Agricultural Experiment Station (Nakhon Ratchasima), Chaiyaphum Seed Multiplication Station (Chaiyaphum), and Northeast Agricultural Center (Khon Kaen) during June to November 1970.

The study carried two objectives: (a) to examine the fibre yields of the varieties involved in a series of a variety trial, and (b) to examine the effect of plant variety and growing conditions on the fibre quality (spinning quality).

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\* "Knot efficiency tests on Khon Kaen kenaf and Pakistan jute" by N.S. Saluja. Rep.no.1 on Res.Proj.no.1/2. ASRCT unpublished report, 1965.

† "The effect of storage at high humidities on the strength of kenaf and jute fibre" by W.L. Greenhill and Naiyana Nopakun. Rep.no. 1 on Res.Proj.no. 1/17. ASRCT unpublished report, 1966.

‡ "Evaluation of kenaf fibre samples from the Department of Agricultural Non Sung variety trial" by W.L. Greenhill. Rep.no. 1 on Res.Proj.no. 1/4. ASRCT unpublished report, 1966.

## MATERIAL AND METHOD

Five varieties of Thai kenaf (H.sabdariffa var. altissima) were employed in this study. Names of varieties are shown in Table 1. The study was treated with a randomized complete block design with four replications. Plot size was 5 x 8 m in all locations. Plantings were made within the first week of June and harvestings within the first week of November 1970. Cultural practices as well as retting were made according to those adopted in each location as follows.

TABLE 1  
SPINNING QUALITY (k) OF KENAF VARIETIES

Variety	Chaiyaphum	Non Sung	Khon Kaen	Variety mean
NS 001	3.710	2.910	3.504	3.375
NS 002	3.065	3.103	3.338	3.169
NS 003	3.139	3.064	3.306	3.170
THS 30	3.112	3.273	3.381	3.256
THS 44	3.134	3.260	3.386	3.260
Location mean	3.232	3.122	3.383	

Non Sung ABS. The land was thoroughly ploughed and harrowed, and, to avoid flooding, the plots were made into seed beds. Kenaf seeds were drilled in rows 30 cm apart. Thinning was given when the seedlings were at a height of about 10-15 cm, leaving a distance of 10 cm between plants. Weeding was made prior to the application of fertilizer: 8, 16, and 8 kg/rai of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O respectively. Second weeding was carried out when the plants were about 50 cm high. No insect and disease control measures were taken. At harvest, the stalks were cut at ground level, bundled, and carried to the retting ditch. Natural earth ditch similar to the roadside ditches was used for the retting. Kenaf bundles were kept submerged by the use of bamboo poles and stakes. The stalks were properly retted 14 days after submersion. The fibre was hand-stripped from the woody stem, thoroughly washed in clear water, and sun dried.

Chaiyaphum SMS. Cultural and retting practices were, on the whole, similar to those employed at Non Sung Agricultural Experiment

Station. Retting time was also 14 days. After washing, the fibre was brought to Non Sung Agricultural Experiment Station and sun dried.

Northeast Agricultural Center (Khon Kaen). Due to better draining capacity of the experimental site, the plots therefore were not prepared into seed beds. At planting, the spacing was kept at 10 cm between plants and 30 cm between rows. Three to five kenaf seeds were planted into a hole. The holes were 10 cm apart and prepared by punching a stick 3-5 cm deep into the soil. Seedlings at the height of about 3-5 cm were thinned, leaving only one healthy seedling to a hill. Weeding, fertilization and after-looking during the growing period were similar to those adopted at Non Sung Agricultural Experiment Station. Retting pond was an earthen one, and the retting time was 16 days. The retted fibre was removed from the stalk by hand stripping, properly washed, and sun dried.

After the fibre weights were recorded, samples from the three locations were brought to Bangkok, prepared and measured for their diameter and ballistic strength. The fibre diameter was measured by an air-permeability test (Mather 1963), the apparatus being generally similar to the "Micronair" used for cotton. Ballistic strength was determined as the energy absorbed by a swinging pendulum which breaks a bundle of fibre stretched across its path. The spinning quality (k) was then calculated by the formula:

$$k = - 0.18 D + 0.19 B + 9.20$$

where D = average fibre diameter in microns

B = average ballistic energy absorbed in g = cm/tex.

## RESULTS AND DISCUSSION

Quantitative fibre yields of the variety trial are analyzed and reported in separate paper. Hence only the fibre qualities are presented and discussed in this report.

Monthly total rainfall\* and monthly mean of average daily temperature\* of Khon Kaen, Chaiyaphum, and Non Sung in 1970 are shown in

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\*Courtesy of Lt. Visit Rasnidatta RTN., Meteorological Department, Bangkok.

Figures 1 and 2 respectively. Distribution of rainfall of all locations during the period of the study was fairly uniform. Dry spell occurred as usual in July when the plants were about one month old. Good rains came in and reached their second peak in September. Temperature at Non Sung was a bit higher than at Khon Kaen and Chaiyaphum, however, the difference did not exceed  $1.1^{\circ}\text{C}$  during the period concerned. It is conclusive that the climatic conditions of the three locations were satisfactory.

Spinning qualities ( $k$ ) of kenaf varieties grown in all locations are presented in Table 1. The statistical analysis showed no significant differences in all respects. The lowest  $k$  value of 2.9 was seen in NS 601 variety grown at Non Sung, and the highest value of 3.7 was seen in the same variety grown at Chaiyaphum. However, values of  $k$  approaching or above 3 indicate a very acceptable fibre.\* The study, therefore, demonstrated that fibre qualities of these varieties produced under such growing conditions and retting practices were statistically in common, and all fibres were very acceptable to commercial rating.

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\* Rep. no 1 on Res.Proj. 1/17, already cited.



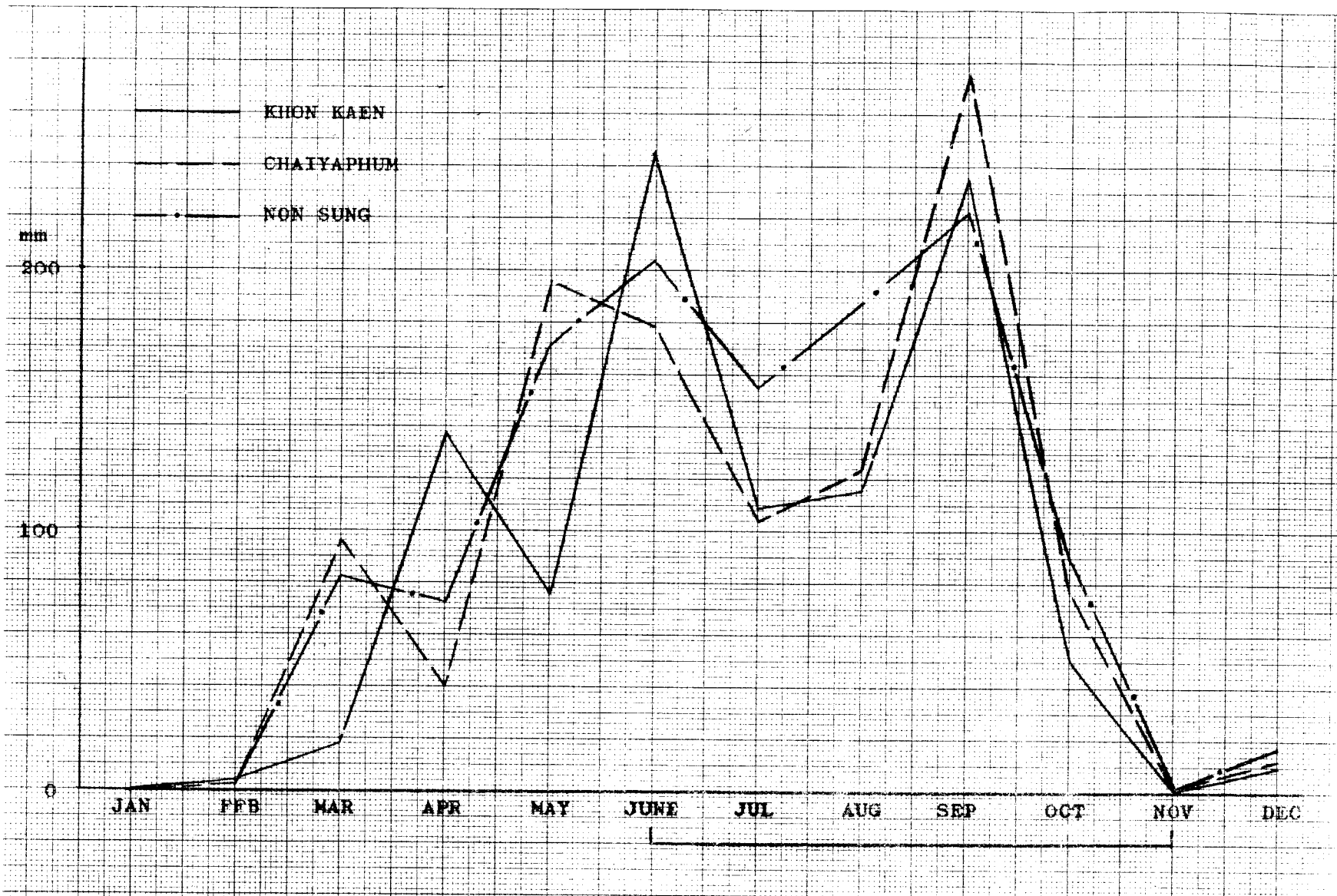


Figure 1. Monthly total rainfall (mm), 1970.

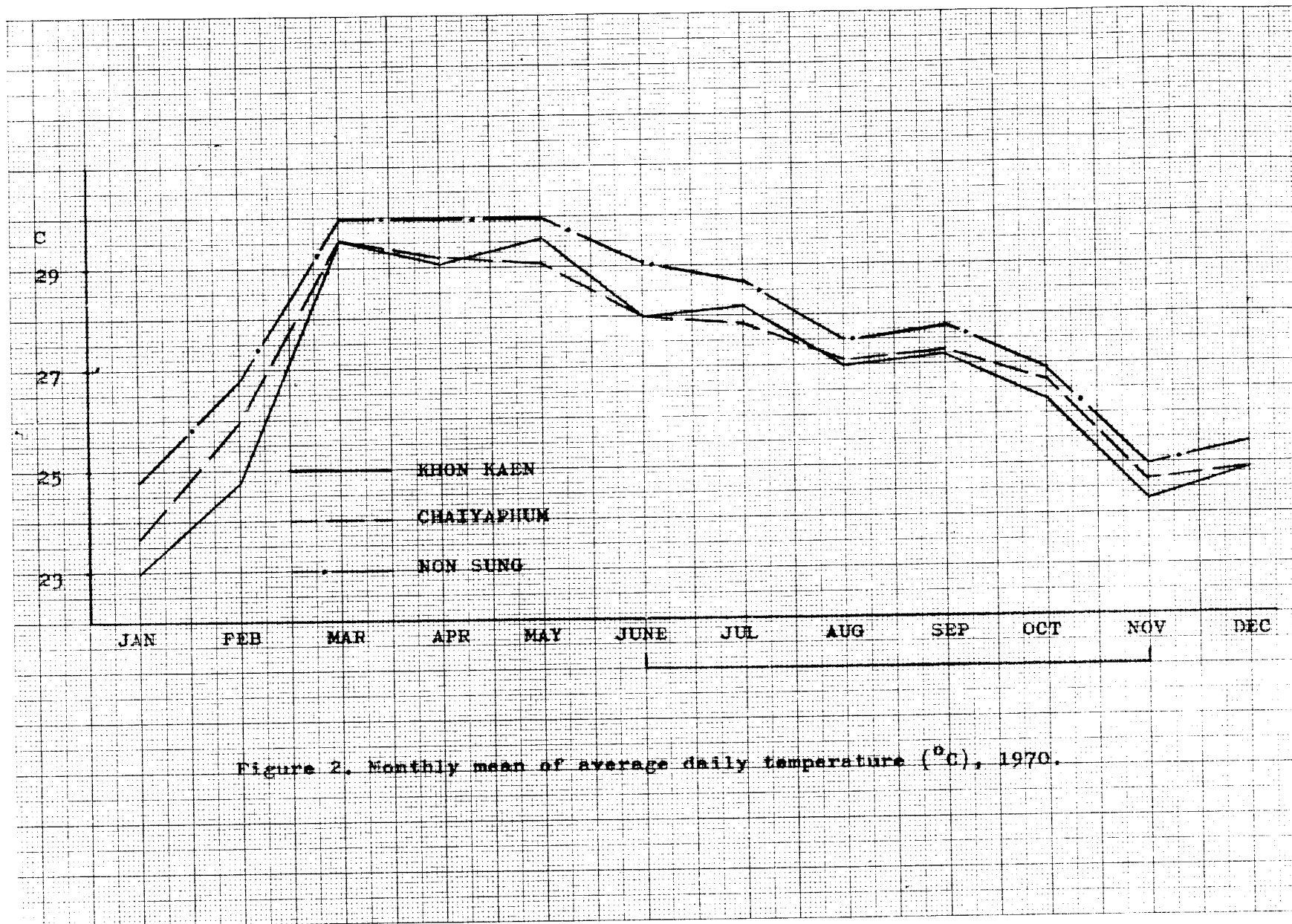


Figure 2. Monthly mean of average daily temperature ( $^{\circ}\text{C}$ ), 1970.

## REFERENCES

- CHOMCHALOW, N., PROMPECHARA, S., and BUENASILPIN, P. (n.d.).—A test on kenaf fibre fineness (การทดสอบความละเอียดของเส้นใยปอแก้ว). Proc. 10th natn. Conf. agr. biol. Sci. (in press). (Kasetsart Univ.: Bangkok.)
- CRANDALL, B.S. (1964).—Performance of kenaf varieties under varying climatic conditions. Proc. 2nd int. Kenaf Conf., 202-206. (Dept. of State, Agency for International Development: Washington D.C.)
- KIRBY, R., PETEUSZKA, M., and SANDER, V. (1970).—Report on the kenaf industry in Thailand. United Nations Industrial Development Organization (id. 70-3792).
- MATHER, J.N. (1963).—The air-permeability test for jute fibre fineness. Bull.Br. Jute Trade Res.Ass. 9: 119-125.
- NIYOMWAN, Naiyana (1968).—Effect of kenaf age on fibre quality (อายุของปอแก้วกับคุณภาพของเส้นใยปอฝอก) Proc. 7th natn. Conf. agr. biol. Sci. (Kasetsart Univ.: Bangkok.)