

A Scientist and a Link of the Chain uniting Thailand and Japan

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The late Dr. Kametaro Toyama is looked upon as a pioneer in genetics.
Let me cite from the frontispiece of 'Cenetics' Vol. 20, 1935, to⁵⁾ study the
outline of the life and works of Dr. Toyama.



Dr. Kametaro Toyama

Kametaro Toyama who was the first of six children of Kanzaburo Toyama, a landowner in a rural district of Kanagawa Prefecture, not far from Yokohama, Japan, was born on September 26, 1867, and died in Tokyo, on March 31, 1918.

He studied at the Agricultural College of Tokyo Imperial University from which he graduated in 1892. In April, 1896, he was appointed principal of Fukushima Sericultural School. After three years, he returned to his alma mater to resume the student life as a postgraduate in the university hall. In 1902, he accepted the invitation of the Siam Government to be chief sericultual expert in the Department of Agriculture. He left his country in February of the same year, and stayed at Bangkok for three years.

After his return to Japan in 1905, he

became a lecturer in Zoology, Department of Agriculture, Tokyo Imperial University, and was appointed Assistant Professor the following year. In 1911, he took the additional post of geneticist in the Imperial Sericultural Experiment Station at Tokyo. From July of 1911 to August of 1913, he was dispatched by the Government to Europe and visited many universities and institutions over there.

In March, 1917, he became ill and was under medical treatment for a full year until his death on March 31, 1918. Though he was appointed Professor of Sericulture in December, 1917, he had no opportunity to give a lecture as a Professor.

Toyama started his research life with the study of anatomy and cytology of the silkworm. Soon after the rediscovery of Mendel's work, he became especially interested in the heredity of the silkworm, and made numerous crossings between various races, especially between Japanese and Siamese races, and followed the segregation of different characters. The results obtained were published in an English paper under the title of "Studies on the hybridology of insects. I. On some silkworm crosses with special reference to Mendel's law of heredity" The Imperial Academy of Japan awarded him the Royal Medal in 1915.

Toyama's interest was never limited to the scientific circle, but was extended to the practical sericulture. Among others, he

earnestly recommended the culture of first generation hybrids to silkworm-raisers who used to rear exclusively pure indigenous breeds up to his time. The spread of the culture of first generation hybrids which took place in a few years from 1911 made an epoch in the history of sericulture in Japan.

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In this report the author is going to give the outline of the situation of the sericulture at the time of Toyama's visit together with the works done by him in Thailand

His travels.

Toyama left Yokohama on board the S. S. Bingo-Maruru on February 7, 1902, for Thailand accepting the invitation of the Thai Government as advisor to the Ministry of Agriculture, concurrently to take the responsibility of the newly established Bureau of Sericulture in the Ministry of Agriculture.^{1) 4) 12) 13)} Afterward he resigned his advisory job at the Bureau and was concurrently appointed as the chief expert in the Royal Sericultural School. His position was to lead and to make projects in the experiments and education in sericulture.

As his contract expired and his health was not good, he resigned and returned to Japan in February, 1905.^{3) 15)}

Sericultural situation in Thailand circa 1902.

1) Administrative as well as experimental Constitution.^{8) 17)}

It is shown as follows:

a) Ministry of Agriculture
(Minister: H. E. Chao Phya Devesr Wongs Wiwadhna)

Central Bureau
Bureau of Land-Registration
Bureau of Irrigation
Bureau of Land Survey
Bureau of Sericulture
Bureau of Treasury

b) Bureau of Sericulture
and

Sericultural Experiment Station
(Chief: Dr. Kametaro Toyama Succeeded by H. R. H. Prince Benga
Location: Saradin in Bangkok.

Site of Buildings: 5 Rhai for Office 1, Laboratory, 1, Residence 3, Mulberry Field: 20 Rhai for planting 60 Japanese, and many Korat varieties.

Budget. 26,290 Bahts for usual activities
71,585 for building and planting.

Personnel: number of personnel
Chief of the Bureau 1 (K. Toyama)
Chief Expert 1 (Heinosuke Yokota)
Experts 3 (T. Mishima, Y. Takano, Z. Hosoya)
Interpreter 1
Workers (Japanese girls) 2
Trainees 6
Workers 8

c) Korat Branch of the Sericultural Experiment Station.

Objectives: To be model plant of sericultural management and to train the sericultural technicians.

Facilities: Mulberry field 180 Rhai
Reeling machine 20 sets
(Sitting type)

Branch Manager: Heinosuke Yokota
Experts: Z. Hosoya, K. Ishida, Y. Nagashima

Assistants: 2

(d) Buriram Advisory Plant

It was established to teach the practical techniques of sericulture to the farmers.

(e) The Royal Sericultural School in Bangkok
Principal: Kyunojo Tahara
Teachers: Y. Takano, T. Nakamura
workers (Japanese girls): 2
Pupils: 15-20

2) Situation of the Sericulture of Thailand¹⁷⁾

The silk production of only one state of Korat was 2000 picles⁶⁾ (1 picle is 600kg) in 1901. The total amount of silk export in the same year was 1,001 picles corresponding^{11) 17)} \$172,710, i. e. 0.4% of the total amount of

exports. This ratio of export was rather low compared with the amount of production, because people used to consume good quality silk for their own use and inferior quality silk was sent for export. The price of 1 picle silk was 700-800 Bahts¹¹⁾ for good silk, 150-200 for bad silk, 100 for worst, while the average price of exported silk was 172 Bahts for 1 picle, i. e. 1/2-1/3 of the Japanese silk.

Sericulture was actively practiced in the states of Nua Rachasima Tanok Kamen Pratin etc.

There are no figures of the area of mulberry field reported. According to Hosoya, 1 Rhai mulberry field produce about 4,000 kg leaves, 285kg fresh cocoons therefrom.

Superior mulberry races were found in Mon keo and in Mon Nooh. The soil in every part of this country was found to be good for mulberry growing.

Propagation of mulberry trees was done by cutting; ¹⁷⁾ 20cm cut branch would grow during the time from May to September as long as 3m with the diameter of 3cm. Man could have a crop of 1,300kg leaves in the first year of planting. The leaf was large and hard like Japanese Roso.

Sericultural farmers in one state of Korat totaled to 30,000, producing about 3,000,000 kg of fresh cocoons and 2,000 picles of raw silk. The duration of one sericultural season was about 25 days. It was possible to repeat eight rearings, but practically 4 times of rearing were considered to be the maximum.^{10) 11) 16)}

Silkworm rearing was practised with a round tray made of bamboo,¹¹⁾ feeding leaves 8 times in the younger stage and 5-6 times for larger worms. The cocoons were yellow and spindle-shaped. One kg of fresh cocoons produced 40-50g of raw silk, i. e. 4.5% of raw silk ratio. The quality of the raw silk was inferior to the Japanese doupion silk and similar to Japanese Noshi-ito. The price, as mentioned above, was 700-800 Bahts for one picle of good silk, and 100 Bahts for bad silk, this was about 1/5 of the

Japanese raw silk.

An example given by T. Mishima¹¹⁾ will give the general idea of the silkworm race at that time:

10g of newly hatched larvae (=ants) contain 30,298 worms
 Duration of feeding period ... 25 days 16h 30 min
 Total amount of leaves given to 10g ants and worms therefrom ... 258,838g
 Mortality ratio 29%
 Cocoon yield for 1g ant 1.8kg
 Raw silk yield 1g ant 92.54g
 Raw silk ratio 5.1%
 Number of cocoons of 1 l 128
 Weight of cocoons of 1 l 108g
 Weight of a cocoons 0.84g
 Injurious insects and diseases were as follows:
 Tachina fly, ants, lizard, but no pebrine disease.

His Works

1) He found a superior mulberry variety. Toyama brought 10 saplings of each 60 Japanese varieties of mulberry, and planted them in the Experiment Station in Bangkok together with many Korat varieties. After detailed investigation, the Japanese varieties except one were all inferior to the Korat ones, among the latter Mon Keo and Mon Nooh were the best. For harvesting Toyama recommended cutting the branches twice a year.

2) He bred a good silkworm race. The indigenous silkworm races of Thailand were just between the wild and domesticated silkworms with the raw silk ratio of only 4-5%.^{10) 17)} Toyama made a new variety from the crossing between Japanese (♀) and Thailand (♂), which showed the raw silk ratio 3 times as the indigenous ones and 30% more yield of fresh cocoons.

3) He improved the method of rearing. He adopted the Japanese method of rearing and was able to get 30% more yield than the former method. Moreover, the quality

of the raw silk from the cocoon produced by the Japanese method was far superior to that of the usual Thai silk, the price being 3 times higher.¹⁷⁾

4) He educated the technicians.

He trained the 10 boys and 10 girls of Royal selection and 15 other pupils in the Royal Sericultural School in Saradin, Bangkok.

In Korat 5 Japanese experts with 2 assistants demonstrated how to manage the sericulture, at the same time they trained sericultural technicians.

In Buriram the Japanese experts taught the farmers practical method.

5) He contributed to the improvement of the other field of agriculture.

He collected as many agricultural seeds as possible to Bangkok and examined their characteristics by growing them in the field of the experiment station.

His opinion concerning the future sericulture of Thailand

The sericultural labor in Thailand was supplied by Laos laborers. However, they were not trained in sericulture but asked a comparatively high wage, 15-20 Bahts for one woman for one month and 20-30 Bahts for one man for one month. One man could produce silk worth only 11-18 Bahts, while the wage was 22-27 Bahts, i. e., the yield could not pay the wage.

In order to stabilize the sericulture of Thailand,

^{14) 18)}
(1) one must breed a good silkworm race at first and next (2) get a cheaper and more efficient labor, if necessary, of Chinese.¹⁷⁾

His effort was rewarded by a steady improvement of sericulture and he believed a greater development in the future owing to the efforts made by the government of Thailand though it was not expected in a short time.

Postscript

The centenary of Dr. Toyama's birthday

was celebrated on several occasions in 1967, A special issue of the Journal of Sericultural Science of Japan came out containing seven contributions of Japanese sericultural scientists. The significance of his works in the science and techniques in sericulture was shown anew. Japanese sericulture owes its development to Dr. Toyama's works, especially to his works in genetics and breeding, and his works in these fields were begun or expanded in Thailand. This fact exemplifies the mutual advantages of international cooperation in science and techniques.

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