

4. PRESENT CORN PRODUCTION STATUS

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Corn is not the indigenous of Thailand, and relatively a new crop to the Kingdom compared to other cereals. It is believed to be introduced in the sixteenth century by the Portuguese traders, and grown as exotic ornamental plant for years. It did not become agricultural importance until the end of the Second World War, when the Government had started the new policy on crop diversification program. During the past 20 years, the area planted and the production have increased extensively. In 1973, the total area of one million hectares were devoted to corn alone with the estimated production of 2.3 million metric tons.

Today, corn is one of the most important field crop in the country, but grown ranked closely to rice and rubber which have been the traditional leading exported commodities for a long time. Less than 10 percent of the grain has been used locally for animal feed and industry. A few variety of white, yellow waxy and yellow sweet are grown commercially around the cities as vegetable corn for human consumption. Young ear corn, picked at silking stage, has also established itself recently as a vegetable and is used for canning as well as a fresh vegetable.

Downy Mildew Situations

Generally, about 25 corn diseases are known to be occur in Thailand. Downy mildew caused by *Sclerospora sorghi* is one of the most destructive corn disease at the present. It was first found in 1968 only in small area of Nakorn Sawan province in the central part of the country. Since then, the disease has spread into the main growing

Table. The total of corn planted area, estimated Downy Mildew infected area and infected provinces, Thailand 1974.

Year	Area planted (1,000 hectares)	Area Infected (hectares)	Infected Provinces
1968	670.9	80	Nakorn Sawan
1969	679.7	1,440	Nakorn Sawan, Supanburi, and Sukhothai
1970	828.8	8,000	Nakorn Sawan, Supanburi, Sukhothai, Kamphangphet, Loburi, Nakorn Rachasima and Saraburi
1971	1,018.9	19,200	Nakorn Sawan, Supanburi, Sukhothai, Kamphangphet, Loburi, Nakorn Rachasima, Saraburi and Petchaboon
1972	997.0	36,800	Nakorn Sawan, Loburi, Saraburi, Petchaboon, Nakorn Rachasima and Singhburi
1973	1,088.3	72,000	Nakorn Sawan, Sukhothai, Kamphangphet, Loburi, Nakorn Rachasima, Saraburi, Pichit, Singhburi, Rachaburi, Samutsongkarm, Petchaboon, Pisanulok, Nakorn Pathom Chaiphum and Bangkok
1974	1,120.0	102,400	Nakorn Sawan, Supanburi, Sukhothai, Kamphangphet, Loburi, Nakorn Rachasima, Saraburi, Pichit, Kanchanaburi, Chainat, Uthaitani, Prachinburi, Anghong, Singhburi, Rachaburi, Petchaboon, Pisanulok. Lei, Prae, Nan, Chiengrai and Khonkaen.

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areas of the country in such an alarming rate. In 1974, it is estimated more than 100,000 hectares have been infected by downy mildew. Based on the rate and direction of spread, one can predict that the downy mildew will cover the entire corn growing area within the next few years. However, the reduction in yields are varies from 10–100 percent depending on locations, environmental and climatic conditions, varieties and stages of plant at infection. It is also difficult to estimate the total loss of corn production caused by *Sclerospora sorghi* due to the fact that the growing areas are still increased annually at the rate of 6–9 percent.

The total of corn planted area, estimated infected area and the infected provinces are presented in Table 1, and the distribution of the disease in Thailand 1974 is shown in Figure 1.

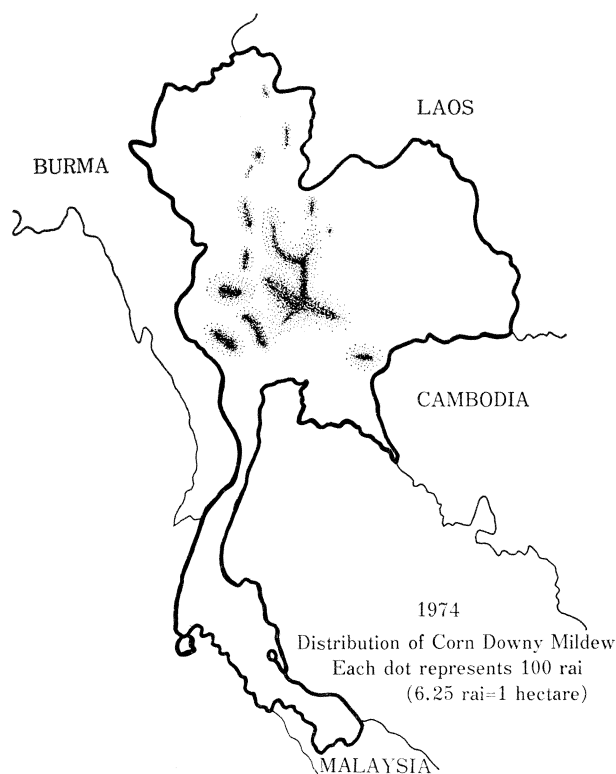


Fig. 1.

Other downy mildew diseases of corn, the brown strips (*Sclerospora rayssiae* var. *zeae*) and the Philippine downy mildew (*Sclerospora philippinensis*) also were reported in 1970 and 1974 respectively. However, the damage is still minor as compared to the other.

Disease Controls

Realized the danger of the disease on corn growing industry of the country, attempts have been made to counter the rapidly spread of the pathogens. The cooperative effort amongst Department of Agriculture, Department of Agricultural Extension, Kasetsart University and The Rockefeller Foundation, to solve the urgent problems have

been carried out since 1968. Some of the main activities are briefly discussed here:—

1) Extension Service and Seed Production

Information on the different methods of disease control, at farm level, were distributed in large scale by means of leaflet and other media, to the extension officers and the farmers. Short courses for agricultural extension officers and farmer leaders from the corn growing areas, were held regularly. The disease symptoms were described with few illustrations. The farmers were recommended to plant corn as early as possible, and if practical, to plant at the same time to the neighbouring farmers. The late planting or planting adjacent to the infected fields was prohibited. Before planting time, all volunteer corn plants should be removed. Few infected plants in the field were recommended to be rogued immediately and burned, especially in the area where the disease was relatively new. Corn Seed were needed to be well dried to prevent the transmission of pathogen; the common practice of transportation of early harvest wet seed from one area to plant in the others was strongly unadvised. Finally, the farmers were recommended to plant the resistant varieties, which were not available at the time.

As already accepted, the most logical, effective means of control the disease is resistant variety. Attempt have been made by our plant breeders and plant pathologists to develop the adaptable, high yielding and resistant variety since 1968, with accelerating rate. However, the stop-gap, resistant varieties were needed for growing in severely infected areas in the mean time. Based on the information and experience from our neighbouring countries namely, Philippines, Taiwan, Indonesia, India, together with the results of The International Downy Mildew Nursery initiated in 1969, few introduced resistant varieties were increased. With the special fund provided by the government in 1972, the total of 200 metrictons of Bogor synthetic #2 and Tainan DMR composite #10, were multiplied and first distributed as the recommended downy mildew resistant varieties. In 1974, only Bogor synthetic #2 and Thai DMR #6 a local developed synthetic variety were distributed with the amount altogether of 200 metrictons. It is hoped that few of the local resistant varieties will be released and multiplied at the end of 1974 season. The main problems of the use of resistant varieties are the inconsistency of their degrees of resistance under different conditions, and the insufficient seed supply.

2) Surveys and Research Activities

The field surveys for disease situation in corn areas have been carried out regularly since 1968. The team of researchers from Department of Agriculture and Kasetsart University visited various provinces during growing season frequently. The informations accumulated from the surveys were very useful in making and effective planning for control measures as well as research projects.

Researches of Thailand National Corn Program, which consists of Department of Agriculture, Kasetsart University and The Rockefeller Foundation, have been focused on the breeding resistance and biology of pathogen. The International Downy Mildew Nursery initiated in 1969, has been carried up to present. Several resistant inbred lines, varieties, composites and germplasm from various countries were introduced and evaluated. Hundreds of local lines and varieties were screened for downy mildew resistant under severe epiphytotic conditions. The selected resistant lines and varieties, together with the high yielding varieties have been manipulated for downy mildew resistance with different breeding methodologies, namely; S₁ line selection, full-sib selection, mass selection, back cross, varietal cross and selection among and within inbred lines. At present, several promising synthetics and composites have been developed and tested, and likely to be released very soon.

Genetic studies on the inheritance of downy mildew resistance also have been conducted. The data suggested a polygenic system involved in *Sclerospora sorghi*.

Attempts have been made to study the overseasoning of the pathogens. No oospores have been found naturally in corn tissue or in soil samples. However, recent findings suggest that oospores may be providing a means of overseasoning. Several species of graminaceous plants also were tested as possible hosts. None of them except sorghum (*Sorghum bicolor*) and teosinte (*Euchlaena mexicana*) showed positive results. The study on seed transmission revealed that the pathogen could transmit on the seed which had high moisture content.

Factors affecting the conidial development of *Sclerospora sorghi*, namely; light, soil moisture, temperature, relative humidity, conidial maturity and concentration, inoculum density, time of inoculation, plant age, etc., have been studied. The information obtained from the results have been applied to artificial inoculation techniques as well as the screening of corn seedlings for downy mildew in controlled greenhouse.

None of the chemical foliar spray experiments gave satisfactory and economical control of the diseases under epiphytotic conditions. The research and test on this field is still carried on.

Future Outlook

At the present, downy mildew of corn is relatively new disease to Thailand, while the peril seems to increase extensively. Many findings have been accomplished in the past 5 years and several experiments and researches are under way. Nevertheless, little has been known about the pathogen and many problems are needed to be solved in order to cease its threat. The most urgent need to our conditions is probably the obtaining of the better resistant varieties. Whenever they are available, the seed are required to be increased and distributed as wide as possible. Furthermore, the breeding programs should be intensified, and the team work among plant breeders, plant pathologists and agronomists have to be strengthened. To better evaluate the true host resistance, more reliable, simple and effective methods of screening the large number of lines are necessary. Efforts should also be made to utilize the resistant germplasm from all parts of the world. The exchange of information and materials among Asian friends, as well as the technical and financial assistance from other developed countries are required and welcome. It is hoped that, with the continuation of cooperation among all organizations involved in corn development together with the strong support from the government, this most fearful corn disease would discontinue its menace to Thailand economy.