TARC Notes

Effect of temperature on conidial size of *Sclerospora maydis*, *S. philippinensis* and *S. sorghi*

Corn downy mildew is the most important disease of corn in the tropical and sub-tropical regions of Asia. Up to the present, nine species of *Sclerospora* and *Sclerophthora* have been reported to attack corn[2]. However, these nine species have not been classified clearly from their conidial morphology. It is generally recognized that the morphology, physiology, pathogenicity, etc. of fungi vary according to culture conditions. In the case of fungi which grow on artificial media it is easy to examine them under the same conditions. All pathogens of corn downy mildew can not be grown on artificial media as they are obligate parasites, and they are widely distributed in various countries. Therefore, some of the data so far used in the classification were derived from the results of observations made under various natural conditions.

Three species of economic importance, *Sclerospora maydis*, *S. philippinensis* and *S. sorghi* collected from Southeast Asia were compared in relation to their morphological and physiological characteristics. This paper reports the effect of temperature on conidial size which is one of the important factors for the classification of these fungi.

Corn seedlings infected with *S. maydis*, *S. philippinensis* and *S. sorghi* were imported from Indonesia, the Philippines and Thailand, respectively. Fungi were maintained by inoculating conidia every month to corn seedlings planted in a greenhouse controlled at 22–32°C.

Infected leaves of corn were collected from the greenhouse at about 5:00 p.m. and washed with running water by using a sponge to remove dust on the leaves. The leaf blades were cut into slices about 11 cm long, and placed in plastic dishes with their lower surface facing a layer of 1.5% agar medium containing 0.01% $HgCl_2$. The plastic dishes were placed into vinylbags to maintain humidity

Table 1. Effect of temperature on conidial size of *Sclerospora maydis*, *S. philippinensis* and *S. sorghi*

Species	Temperature (°C)	Length (μ)		Width (μ)		Length/Width
		Range a)	Mean b)	Range	Mean	
S. maydis	14	22.1—29.7	26.4	20.5—28.6	25.7	1.02
	18	20.7—28.8	25.0	20.5—26.4	23.2	1.07
	22	20.3—29.3	24.1	18.8—27.5	23.3	1.03
	26	20.1—28.6	23.7	20.1—26.2	23.0	1.03
	28	19.9—27.9	24.0	19.9—25.8	23.4	1.03
S. philippinensis	14	33.4—51.7	43.7	18.1—25.3	20.8	2.09
	18	36.9—52.8	47.5	18.1—24.5	20.7	2.29
	22	38.6—64.2	51.6	18.1—25.1	20.2	2.54
	26	41.5—71.4	54.9	17.0—21.8	19.4	2.83
	28	41.7—76.0	56.4	15.1—22.7	18.4	3.07
S. sorghi	14	22.7—31.9	27.0	16.8—21.4	18.8	1.43
	18	20.7—37.3	28.8	16.6—26.0	19.9	1.44
	22	23.6—39.3	30.4	17.2—23.8	20.7	1.46
	26	24.0—39.7	31.3	17.9—25.5	20.9	1.50
	28	26.2—39.3	32.7	17.5—26.0	21.9	1.51

For each treatment, 6 plastic dishes were used and 30 conidia were measured in each plastic dish.

a) Maximum and minimum value in 180 conidia.

b) Average of 180 conidia.

conducive to sporulation, and then kept in a growth chamber set at 14, 18, 22, 26 and 28°C, respectively, for 15 hrs (6:00 p.m. to 9:00 a.m.). The size of conidia discharged on agar medium was measured at 400× magnification. The data are shown in Table 1.

In *S. maydis*, the length and the width of conidia ranging on the average 23.7–26.4μ and 23.0–25.7μ, respectively, were not affected by temperature. Ratio of length to width ranged 1.02–1.07, on the average. The shape of conidia was globular at all the temperatures tested.

In *S. sorghi*, the size of conidia tended to be larger as the temperature rose. The range of length and width of conidia was 27.0–32.7μ and 18.8–21.9μ on the average, respectively, and ratio of length to width was about 1.5 at all temperatures tested.

In *S. philippinensis*, conidia became longer with the increase in temperature. Conidia were only 43.7μ long at 14°C but reached a length of 56.4μ at 28°C on the average. There was no remarkable difference in the width of conidia ranging from 18.4μ to 20.8μ, on the average, although they tended to be narrower as the temperature increased. Therefore the ratio of length to width was only 2.09 at 14°C but 3.07 at 28°C on the average. In other words, conidia became more oblong-ellipsoid as the temperature rose.

Tasugi[3] and Leu[1] reported a change in conidial size of Peronosporaceae with temperature. In the present study, conidial size of *S. maydis* did not change with temperature while that of S. *philippinensis* and *S. sorghi* was affected by temperature.

In *S. sacchari* growing on sugar cane, Leu[1] reported that the effect of temperature on the length of conidia could be classified into 3 phases, 1) at 22–30°C, the average length was 41–45μ, 2) at 18°C, 36μ, and 3) at 10–14°C, 29–30μ. Width of conidia ranging from 17.6 to 20.1μ on the average was not affected by temperature. When comparing the conidial size of *S. sacchari* reported by Leu with that of the three species tested in this study, it was easy to distinguish *S. sacchari* and *S. maydis* under all temperatures tested, but distinction between *S. sacchari* at high temperature (22–30°C) and *S. philippinensis* at low temperature (14–18°C), and *S. sacchari* at low temperature (10–14°C) and *S. sorghi* at temperatures varying between 14 to 28°C was not possible. These findings suggest that the comparative study of conidial size of fungi causing corn downy mildew, for a purpose of classification, must be made at the same temperature. If conidia are formed under natural conditions, meteorological conditions conducive to sporulation must be taken into account to avoid misinterpretation.

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Different origins of rice gall midge occurrence in Thailand

The rice gall midge, *Orseolia oryzae* (Wood-Mason) in the family Cecidomyidae, is one of the important insect pests of rice in the tropical Asia. In Thailand, studies on forecasting method of the insect occurrence have been conducted with special reference to relationship between population density of the insect on wild host plants during dry season and damage of rice plants during wet season.

A total of 4 kinds of the wild host plants was reported from Thailand (Hidaka et al. 1974). So far as present studies are concerned, the wild rice is found to be the most important host plants of the rice gall midge, followed by *Leersia hexandra* which is said to be morphologically close to rice plants.

In Chiengrai Province of northern Thailand, wild rice is found in field ditches into which water is supplied throughout the year. Big flora of wild rice is also seen intermittently along the High Way, Phaholyothin Road. Under such a condition, the galls were not seen on wild rice in January and February. However, galls began to occur from March, and two peaks of gall occurrence were recognized in June and September-October. The highest damaged tillers of wild rice reached 84% at the end of October at Pasang Village, Chiengrai Province. It is obvious that a great number of larvae is found in wild rice during dry season.

Table 1. Different kinds of wild host plant of rice gall midge in Thailand

District	Locality	Wild host plant
North	Chiengrai	wild rice
	Phrae	*Leersia hexandra*
Northeast	Ubol	*Paspalum* sp.

As given in Table 1, a host plant, *Leersia hexandra*, was investigated at the Phrae Rice Experiment Station in dry and wet seasons because no wild rice is found at Phrae Province. The host plant is grown in ditches and dykes of paddy fields and can be seen all year round. The rice gall midge raised in rice plants in October-November was found to migrate to *Leersia hexandra*. The insect usually enters into the host plant at larval stage in dry season. The insect began to appear from April and disappear in the beginning of June. Rice gall midges were not found on *Leersia hexandra* in the planting season.

In Phibul Mansahan Village in Ubol Rachathani Province, northeast of Thailand, there is an area with the serious occurrence of the rice gall midge, although host plants so far known for the insect have not been found there yet. *Paspalum* sp. is supposed to be one of the host plants because this plant is grown abundantly in paddy fields instead of wild rice and *Leersia hexandra*. A few galls were collected from *Paspalum* sp.. Small flora of wild rice grown near Sirithorn Dam in the village was found but the size of the flora is not enough as an origin of the insect occurrence.

As mentioned above, it is obvious that the kinds of wild host plant of the rice gall midge are quite different from locality to locality.

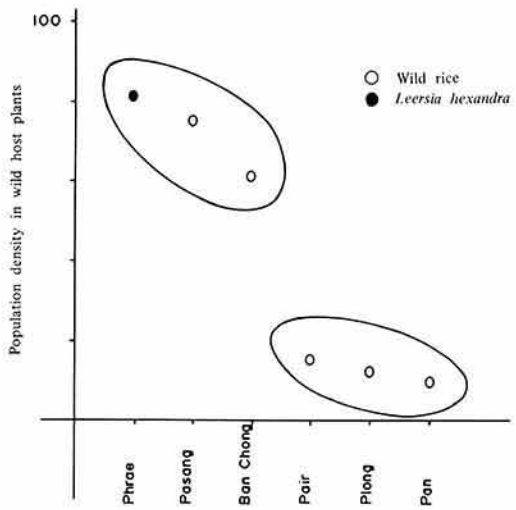

Fig. 1. Difference of population density of rice gall midge in wild host plants between areas with serious occurrence of the insect and areas of low infestation in northern Thailand

This is a most important finding that the rice gall midge occurs from different host plants by localities. It is necessary to study whether or not the rice gall midges originated from these different host plants have any biological differences.

In order to clarify relationship between serious damage of rice plants in wet season and population density of the insect in wild host plants in dry season, a study was carried out in Pasang, Ban Chong, Pair, Plong and Pan Villages in Chiengrai Province and Phrae in Phrae Province. In all of these areas, rice cultivation is not practiced in dry season. Three localities, Phrae, Pasang and Ban Chong, were observed to be seriously damaged by the insect. As given in Fig. 1, it is recognized that population density of the rice gall midge in wild host plants in dry season is extremely higher in the seriously damaged areas than in low infestation areas. Survival rate of the insect larvae in wild host plants is considered to be high in the former areas. Numerous eggs were deposited on wild host plants by adult females migrated from rice plants before harvesting. It is considered that this finding is also important for the development of studies on the forecasting technique of the gall midge occurrence in northern Thailand.

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