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Survey and Incidence of Leaf Blight and Leaf Spot Diseases of Oil Palm Seedlings in Southern Thailand

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Abstract: The quality of oil palm (*Elaeis guineensis* jacq.) in nursery stage seedlings can be reduced by several diseases, particularly leaf blight and leaf spot, with equal adverse effect on market value. This research was conducted to evaluate these diseases in nursery stage of oil palm seedlings collected from eleven provinces in southern Thailand. A total of 197 fungal colonies were isolated from 277 disease samples. Based on morphological characterization and disease symptoms, the major fungal isolates found in this study in decreasing order belonged to the genera *Curvularia* 149 isolates and *Colletotrichum* 48 isolates, with disease incidence in decreasing order of *Curvularia* (61.01%) and *Colletotrichum* (22.38%). This report indicates the increasing importance of leaf spot disease in Thailand and the need for effective disease management. To design an effective method for controlling leaf spot diseases in nursery stage, further biological and chemical applications are needed.

Key words: Disease incidence, leaf blight, leaf spot, oil palm seedling

INTRODUCTION

The oil palm (*Elaeis guineensis* jacq.) is one of the most economically important crops in southern Thailand. The total area of oil palm production in Thailand is approximately 625,600 ha and of this about 528,400 ha is in the south (Chavananand, 2011). Oil palms are enriched with numerous nutrients, fatty acids and vitamin A and E, which can be used for consumption in the food industry, in cosmetics production and for renewable energy. Oil palm planting needs high rainfall to gain high yield production. As high levels of humidity can induce germination of some phytopathogenic fungi, oil palms are faced with several diseases in all stages of growth, from seedling nursery stage to mature plant.

A major cause of leaf blight and leaf spot of oil palm is caused by fungi. In general, leaf blight and leaf spot symptoms caused by fungi are mostly similar (Elliott, 2005) and the disease can hardly be distinguished by symptom alone. The disease primarily affects young seedlings up to 3 months old or seedlings which have recently been transplanted (Turner, 1981). In Africa, anthracnose caused by *Botryodiplodia palmarum*, *Melanconium* sp. and *Clomerella cingulata* resulted in severe damage with important economic input, while in southeast Asia *Curvularia* leaf blight (*Curvularia eragrostidis*) and *Leptosphaeria* leaf spot (*Pestalotiopsis* spp.) were common (Aderungboye 1977).

Leaf spot disease is considered to be a minor problem but it can spread rapidly in oil palm growing areas of Thailand, Papua New Guinea, India and Sri Lanka (Aderungboye, 1977). The *Cercospora* leaf spot caused by *Cercospora elaeidis* is the most widespread foliar disease of nursery seedlings and young oil palms in west Africa (Rajagopalan, 1973). The host range of leaf spot disease includes not only oil palm but also other plants. For example, *Pestalotiopsis palmarum* is one of diseases of coconut widespread in many countries (Ohler, 1999), *Curvularia eragrostidis* yam leaf spot is a serious concern among the northeast Brazilian yam growing areas (Michereff *et al*., 1994) and petal blight of dendrobium is a problem in the northern Territory (Duff and Daly, 2002).

Only few previous studies have been conducted on leaf blight and leaf spot disease and their distribution in Thailand. Therefore, the objective of this study was to examine these diseases in the nursery stage of oil palm and to prepare a distribution map of these diseases for southern Thailand.

MATERIALS AND METHODS

Field inspection and disease sample collection: Surveys were conducted to diagnose leaf spot and leaf blight in oil palm seedlings in planting areas of eleven provinces around southern Thailand during 2011 and 2012. Five infected leaves per plot were placed in plastic

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bag and stored in a cooler box. The collected samples were brought to the laboratory for isolation and identification of the causal agent of leaf blight and leaf spot disease.

Isolation of the pathogens from suspected leaf spot and leaf blight symptoms: The infected leaves samples showing leaf blight and leaf spot symptoms were washed in sterilized water and placed on sterilized tissue paper and incubated in a moist chamber at 25°C for 3 days to induce sporulation. Single spore isolations were made within 24 h of cutting. Single spores collected from leaf blight and leaf spot were cultured in Corn Meal Agar (CMA) (HiMedia, Mumbai, India.) and incubated at 25°C for 10 days. Characterization of leaf blight and leaf spot of oil palm seedlings was examined based on morphological analysis. Spores/conidiophores were examined using light microscopy (Olympus CH30RF200, Japan).

Disease incidence: The disease incidence of oil palm seedlings was analyzed under nursery conditions. A total of 277 leaf samples was used as the denominator, while the number of each isolate was used as the numerator. Disease incidence was calculated based on the following equation:

$$\text{Disease incidence (\%)} = \frac{x1}{x2} \times 100$$

where, x1 is the total number of each isolate of fungi and x2 is the total number of collected plants which showed leaf blight and leaf spot symptoms.

RESULTS AND DISCUSSION

The total of 277 samples of symptomatic leaf blight and leaf spot were collected from nurseries in eleven provinces of southern Thailand. The most common symptoms appearing during nursery stage were leaf blight and leaf spot. The leaf blight showed as small circular and translucent yellow to brown necrotic tissue diffusely scattered on leaves, while leaf spot was demonstrated by dark brown pin point on the leaves. The collected samples were subjected to single spore isolation on CMA and maintained in Potato Dextrose Agar (PDA). The leaf blight and leaf spot causal agents were examined by compound microscope and were identified as the genera *Curvularia* and *Colletotrichum* leaf spot based on morphology. The most common fungal isolates found in this study in decreasing order were *Curvularia* 149 isolates, *Colletotrichum* 48 isolates with disease incidence in decreasing order of *Curvularia* leaf spot (61.01%) and *Colletotrichum* leaf spot (22.38%) (Table 1).

Table 1: Disease incidence of leaf spot and leaf blight of oil palm seedling

Diseases	No. of each isolate	Disease incidence (%)
Curvularia leaf spot	149	61.01
Colletotrichum leaf spot	48	22.38
Total	197	

The major pathogens which caused leaf blight and leaf spot on oil palm seedling belonged to *Curvularia* and *Colletotrichum* genera. The obvious symptom of *Curvularia* leaf spot was the appearance of small yellow spots on the leaves. The progress of symptoms started from light brown, changing to dark brown and covering almost all parts of the leaves. Finally, the infected leaves turned black (Fig. 1a). The colony of *Curvularia* was dark brown (Fig. 1b). Characteristics of conidiophores and codinia were observed by compound microscope. The conidiophore was single with one conidium, simple or branched, straight or flexuous and brown to dark brown. Conidia were 3-distoseptate, approximately ovoid, obclavate or almost elliptical with the second cell from the base the largest and 24-40×12-22 μm in size. Based on morphological analysis, this was identified as *Curvularia oryzae* (Fig. 1c).

Oil palm anthracnose on nursery stage was caused by *Colletotrichum gloeosporiodes*. This disease begin as small brown spots and water soaked spots. The infected areas expand into circular spots with tan to light brown centers. As the spots expand, lesion centers lighten to very light tan to cream color with some spots developing brown margins around the centers (Fig. 1d). The colony of *C. gloeosporiodes* was white to grey color with delicate and thin mycelia (Fig. 1e). The conidia cylindrical shape was smooth and 3-5×9-14 μm in size (Fig. 1f).

Furthermore, *Pestalotiopsis*-like leaf blight and *Cercospora*-like leaf spot symptoms were also found in this observation. The *Pestalotiopsis*-like leaf blight lesions appear black and sunken on leaves. Old lesions have somewhat grey borders and may contain spore clusters in the center (Fig. 1g). The *Cercospora*-like leaf spot symptom were the appearance of small yellow spots with a brown point in the middle. They spread and transform to brown and then are surrounded by a yellowish halo. At a later stage, most spots became brown speckle scattered over the leaf (Fig. 1h). Nevertheless, the isolation of minor disease on oil palm seedling was not done in this study.

Leaf spot and leaf blight diseases are commonly found in nursery stage oil palms. Leaf spots due to *C. oryzae* and *C. gloeosporiodes* are major diseases of oil palm seedlings in nursery stage and have been recorded as causing moderate to severe damage in wide areas of Malaysia, Sabah, Sumatra and Thailand (Turner, 1981). It has been also reported that *C. oryzae* caused leaf spot on mature oil palm in Krabi Province, southern

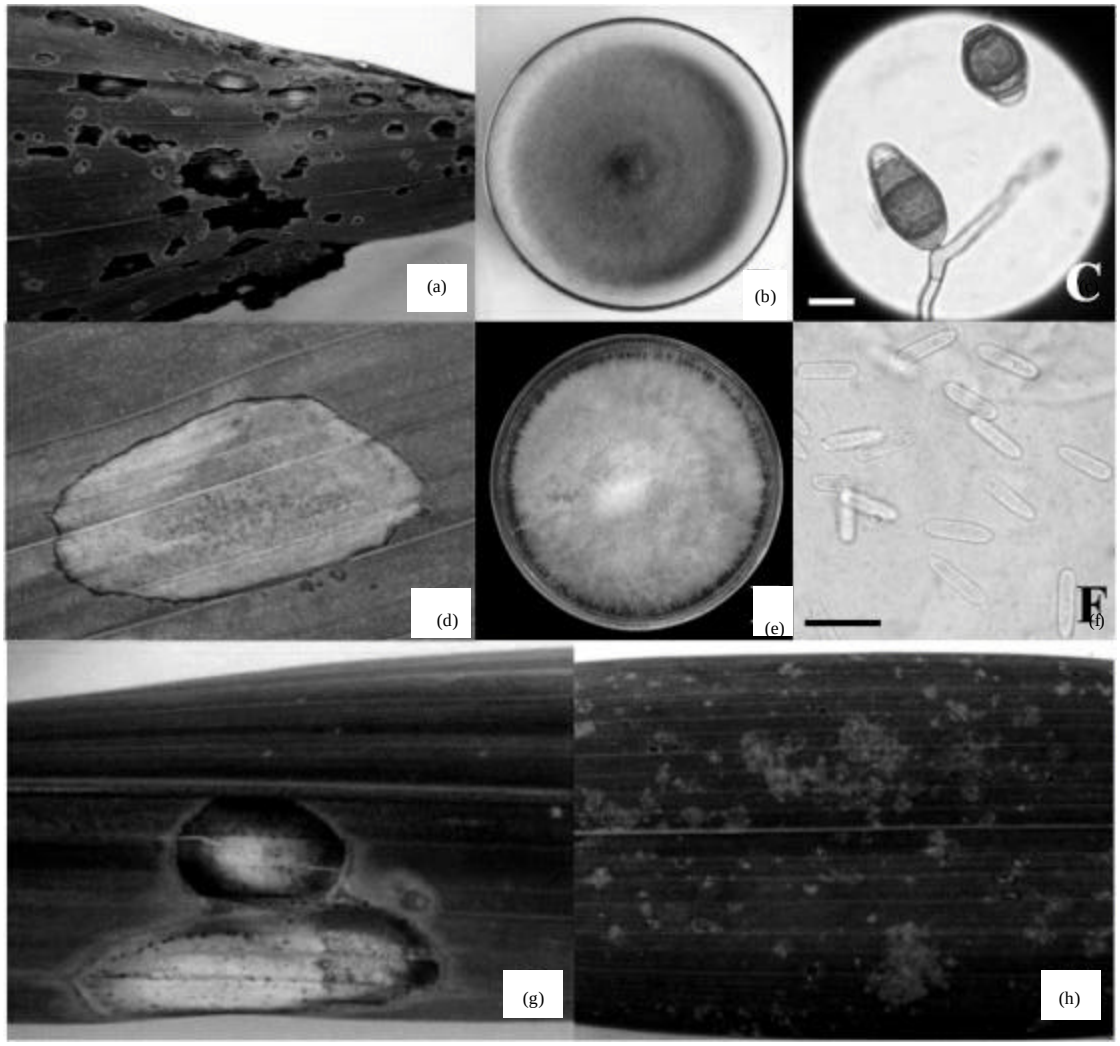

Fig. 1(a-h): (a)Symptom of *Curvularia* leaf spot, (b) Colony of *Curvularia oryzae* incubates on CMA agar for 10 days, (c) Conidiophore and conidia of *C. oryzae*, (d) Symptom of anthracnose causal by *Colletotrichum gloeosporioides*, (e) Colony of *C. gloeosporioides* on CMA agar for 10 days, (f) Conidia of *C. gloeosporioides*, (g) *Pestalotiopsis*-like leaf blight on oil palm and (h) *Cercospora*-like leaf spot, Bar = 10 μm

Thailand (Doungsa-ard *et al*., 2011), while *C. lunata* and *C. maculans* have been documented as causal agents of leaf spot in oil palm in Malaysia (Englert *et al*., 1999). Leaf blight and leaf spot diseases can be caused by several fungal genera, such as *Annellophora*, *Bipolaris*, *Cercospora*, *Colletotrichum*, *Calonectria* (*Cylindrocladium*), *Exserohilum*, *Gliocladium*, *Pestalotiopsis*, *Pestalotia*, *Phaeotrichoconis*, *Phyllachora*, *Pseudocercospora* and *Stigmina* (Elliott, 2005) in Florida. In Venezuela, *Pestalotiopsis* leaf blight was caused by *Pestalotiopsis palmarum* and *Pestalotiopsis glandicola* (Labarca *et al*., 2006). Suwannarach *et al*. (2013) recently reported leaf spot disease on oil palm in Chiang Mai Province, northern Thailand, caused by *Pestalotiopsis theae*.

The results from our study are the first report of leaf blight and leaf spot disease dispersal of oil palm seedling in southern Thailand (Fig. 2). These diseases are caused by at least two genera of fungi; *Curvularia* and *Colletotrichum*. The major fungal genera causing leaf blight and leaf spot are *Curvularia* and *Colltotrichum*. Knowledge of the distribution of pathogenic fungi in

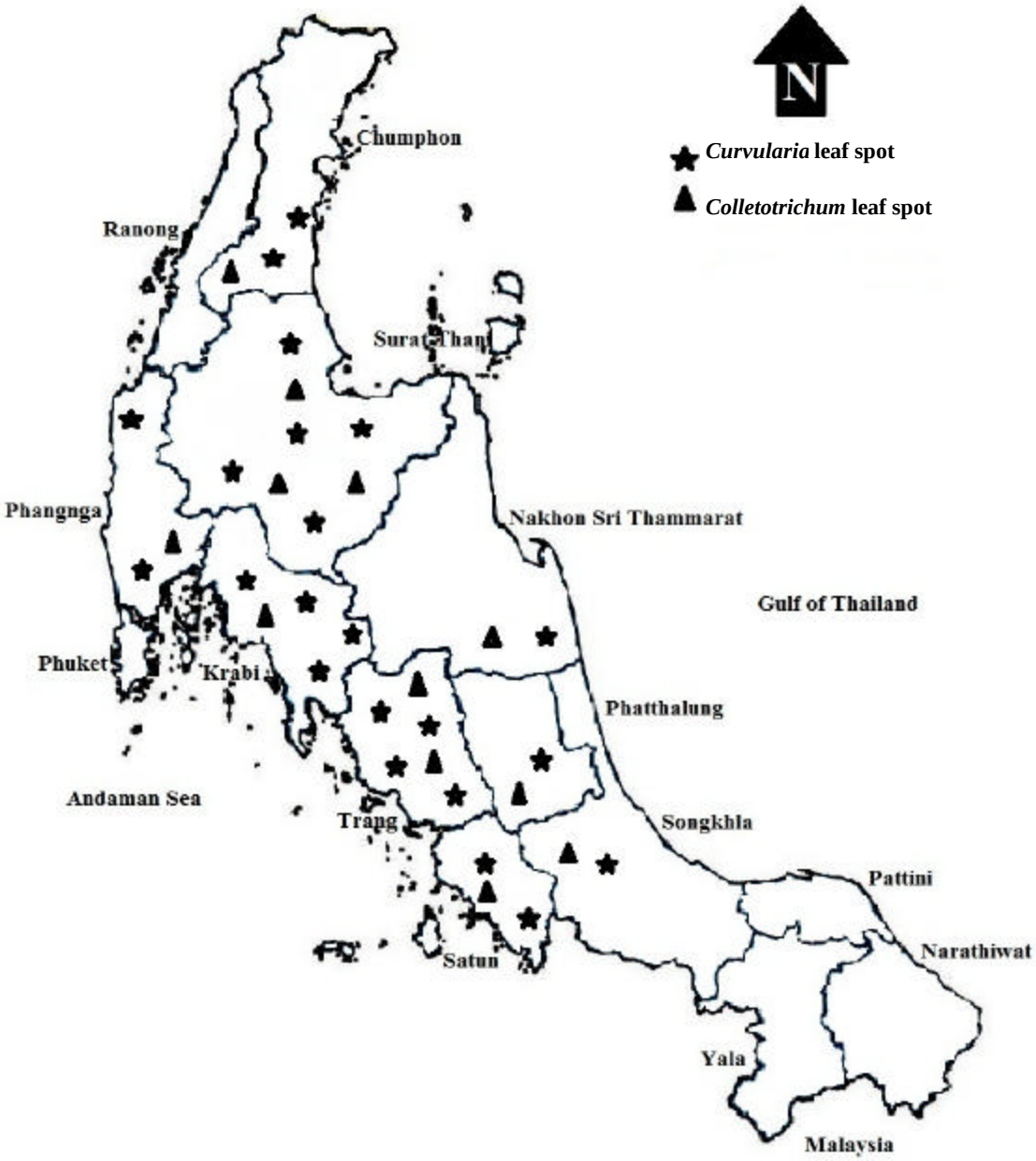

Fig. 2: Epidemiology map of leaf blight and leaf spot in southern Thailand, Symbols represent the diseases

oil palm nurseries is likely to be most important for farm advisors to guide farmers in disease management and control. Further studies on fungal species, their morphological, biological and molecular characterization and their management are needed.

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REFERENCES

Aderungboye, F.O., 1977. Disease of the oil palm. Trop. Pest Manage., 23: 305-326.

Chavananand, K., 2011. Future of the Thai palm oil industry. IMPACT, Bangkok, September 8, 2011. http://www.thaipalmoil.com/paper2011/MR.%20KRISADA_CHAIRMAN%20THAI%20PALM%20OIL%20INDUSTRY%20CLUB.pdf

Doungsa-Ard, C., P. Athipunyakom and R.G. Shivas, 2011. Curvularia (*Curvularia oryzae*). http://www.padil.gov.au/thai-bio/Pest/Main/140456/30855.

Duff, J. and A. Daly, 2002. Orchid disease in the northern Territory. Agnote, 568 No. I3, June 2002. https://transact.nt.gov.au/ebiz/dbird/TechPublications.nsf/E32B337711518CD369256EFE004F63B8/$file/568.pdf

Elliott, M.L., 2005. Leaf spots and leaf blights of palm. One of a Series of the Plant Pathology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida Press, pp: 218.

Englert, J.M., J.G. Scheetz and R.S. White, 1999. Improved conservation plant materials released by NRCS and cooperators through September 1999. USDA-NRCS, Beltsville, MD.

Labarca, M., N. Sanabria and A. Arcia, 2006. *Pestalotiopsis palmarum* cooke pathogenicity on nursery-oil palm (*Elaeis guineensis* Jacq.) plants. Rev. Fac. Agron., 23: 414-421.

Michereff, S.J., N.S.S. Silveira, A. Reis and R.L.R. Mariano, 1994. Epiphytic bacteria antagonistic to *Curvularia* leaf spot of yam. Microbial. Ecol., 28: 101-110.

Ohler, J.G., 1999. Modern Coconut Management: Palm Cultivation and Products. Intermediate Technology Publication Press, London, ISBN-13: 9781853394676, Pages: 458.

Rajagopalan, K., 1973. Effectiveness of certain fungicides in controlling Cercospora leaf spot of oil palm (*Elaeis guineensis* Jacq.) in Nigeria. J. Nigerian Instit. Oil Palm Res., 5: 23-30.

Suwannarach, N., K. Sujarit, J. Kumla, B. Bussaban and S. Lumyong, 2013. First report of leaf spot disease on oil palm caused by *Pestalotiopsis theae* in Thailand. J. General Plant Pathol., 79: 277-279.

Turner, P.D., 1981. Oil Palm Diseases and Disorders. Oxford Unviersity Press, Oxford, pp: 88-110.