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Assessing smallholder rice farmers knowledge, perception and management practices about rice leaf scald disease (Rhynchospium oryzae) in Togo (West Africa)

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Abstract

Leaf scald is a rice disease whose damage can reach 30% of yield losses. For several years, Togolese producers in the central region have noted a resurgence of this disease in their rice fields. In this situation, a survey was conducted throughout the country to assess rice farmers level of knowledge perception and management practices of about of this disease. The data was randomly collected from 115 rice farmers in 25 prefectures out of a list of 39 in Togo. Using descriptive statistics, the results show that respondents who have more than 5 years of experience in rice growing (93%) acknowledge having seen the symptoms of the disease. In the lowlands, all producers recognized the symptoms and damage but do not know the name of the disease. As a cause and conditions aggravating leaf scald, producers (24%) listed drought, flooding and excessive use of fertilizers and herbicides. The damage according to producers is significant to very significant for 46% of producers. Concerning management method, respondents (21%) said they use fungicides, insecticides and ash, which methods remain (60%) ineffective. The contact with the agricultural technical services (34%) did not allow a solution to be found (58%). This survey highlighted the need to help Togolese producers to find effective solutions against rice leaf scald.

Keywords: rice, disease, leaf scald, farmers knowledge, Togo

1. Introduction

Rice is the second cereal after corn in terms of production in Togo. According to the Ministry of agriculture, paddy rice production was around 171.8 thousand tons in 2022 mostly driven by lowland rice (55%) and rainfed rice (34%) (DSID, 2022). This crop is faced with constraints, in particular common fungal diseases including rice blast and helminthosporiosis. These diseases are known by Togolese farmers. Rice farmers have the support of the extension services in the implementation of a certain number of available solutions. Nowadays, it is more and more noticed new diseases in Togolese rice fields causing damage of greater severity. Among these diseases, which are very little known by Togolese producers, is rice leaf scald caused by *Rhynchosporiun oryzae*. This disease, first described in 1955 in Japan, generally appears late after other fungal diseases of rice. The damage caused by this disease is up to 25% (Filippi, et al., 2005). In West Africa, it was first studied in 1972 (Lamey & Williams, 1972) and subsequently in Ivory Coast, Sierra Leone, Ghana in 2000 (Turner & Black, 2001). A poster was designed briefly describing the disease and indicating some measures to be taken by producers to manage leaf scald (Mutiga, et al., 2019). In the Togolese context where the disease has been reported with losses of up to 90% in the central region (Amadou, 2020), there is a lack of documentation combining diagnostic and solution in the Togolese context. In this situation, it is very important to assess the level of understanding of producers the measures taken to fight or prevent leaf scald disease. This study was designed to measure the level of knowledge of the disease by producers and the different actions undertaken by them to reduce the damage caused by leaf scald locally.

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2. Methodology

2.1 Study area

The study area is Togo.

Togo is a small country bordered to the north by Burkina Faso, to the south by the Gulf of Guinea, to the east by Benin and to the west by Ghana. The survey was conducted in 29 out of 39 prefectures in Togo. The prefectures were chosen in the administrative regions. In each prefecture, the RICOWAS (Scaling up climate-resilient rice production in West Africa), a project aiming to increase rice production in west Africa project, which aimed to promoting rice productivity, sites were prioritized. At least three sites were surveyed in each prefecture, for a total of 97 sites.

At each site at least one producer was surveyed. When the producers are in groups and the production plots are adjacent and continuous, the name of the person primarily responsible was recorded. In this case the response recorded for the aspects of knowledge of the disease, prevention and control is a summary of the group discussions.

2.2 Questionnaire design

The questionnaire was designed by combining closed and open questions. These different questions cover three major areas, namely the socioeconomics characterization of the respondent and his environment, knowledge of the disease and its manifestations and finally the means of prevention and control of the disease.

The questionnaire was designed on KoboToolbox. Printouts clearly showing the different aspects of leaf scald symptoms were also used in the survey.

2.3 Data collection method

The data collection took place from July to November 2023. The questionnaire was administered individually for isolated rice plots or isolated producers. For sites where mutual assistance is dominant, such as the Kara and Central region, group discussion was organized.

The questionnaire was administered next to the producer's rice field or in his field. At the stage of questions on knowledge of the disease, printed images were shown to the producers. After this stage a descent into the rice field allows the producer to confirm the accuracy of the disease and continue with the assessment of the disease damage.

2.4 Data analysis

The collected data was analyzed using descriptive statistics (mean, percentage, frequency etc. the cross-tabulation method for closed questions and the responses were presented as a percentage of producers by region according to the responses).

As for the open questions, a qualitative analysis was conducted. A summary of the answers made it possible to bring out the essential information from the discussions with the producer(s).

3. Results

3.1 Socio-demographic characteristics of the population

Three quarters respondents are mainly male (Table 1). A high proportion of women (44.5%) was observed in the savannah region.

Table 1Socio-demographic characteristics of the respondents by region

	Regions					
Socio-demographic characteristics	**Central**	**Kara**	**Maritime**	**Plateau**	**Savannas**	**All regions**
Age						
Under 25 years old	1.8	0.0	0.0	0.0	0.0	1.8
25 and 35 years old	5.5	5.5	0.0	1.8	5.5	18.2
36 and 45 years old	7.3	5.5	18.2	1.8	5.5	38.2
46 and over	1.8	7.3	14.5	5.5	12.7	41.8
Sex						
Female	3.6	3.6	5.5	5.5	7.3	25.5
Male	12.7	14.5	27.3	3.6	16.4	74.5
Education level						
none	1.8	3.6	9.1	0.0	7.3	21.8
primary	3.6	0.0	5.5	3.6	3.6	16.4
secondary I college	9.1	7.3	10.9	3.6	9.1	40.0
secondary II high school	0.0	5.5	1.8	1.8	3.6	12.7
university	1.8	1.8	5.5	0.0	0.0	9.1
Marital status						
Single	0.0	0.0	0.0	0.0	1.8	1.8
husband	16.4	18.2	32.7	9.1	21.8	98.2
Number of people in charge						
0	0.0	0.0	0.0	0.0	1.8	1.8
3 and 5	10.9	5.5	12.7	3.6	1.8	34.5
6 and 8	3.6	7.3	18.2	3.6	7.3	40.0
8 and up	1.8	5.5	1.8	1.8	12.7	23.6

In terms of age, more than 80% of respondents are over 36 years old. The extreme ages are about 1.8% for those under 25 and 41.8% for those over 46-year-old. Concerning education, a large proportion of respondents have not received any formal education (17.1%). Nearly half (40%) of respondents have secondary education level I (college). Very few have reached university level (9.1%) (Table 1). Three quarters of respondents are made up of households of 3 to 8 people.

3.2 Agricultural practice of respondents

In general, the respondents (57.1%) have rice cultivable areas located between 0.25 ha and 1 ha. This proportion was followed by farms of 2 to 5 ha which constitute 31.4% of the plots encountered. Very few have areas greater than 10 ha (table 2).

Table 2Agricultural practices of respondents by region

Regions						
Agricultural practices	Central	Kara	Maritime	Plateau	Savannas	total
rice ecology						
Shallows	100	100	50	100	69.23	85.71
irrigated	0	0	50	0	30.77	14.29
Area cultivated for rice						
0 -1 ha	60	70	100	80	30.77	57.14
2-5 ha	40	30	0	20	38.46	31.43
6-10 ha	0	0	0	0	23.08	8.57
11 ha and more	0	0	0	0	7.69	2.86
How many years have you been growing rice?						
Less than 5 years old	60	30	50	80	15.38	37.14
6 and 10 years old	20	20	50	0	15.38	17.14
More than 15 years	20	50	0	20	69.23	45.71

The producers interviewed are mostly very experienced in rice production. Nearly two thirds have more than 6 years of experience (Table 2).

3.3 Knowledge of the disease

More than 93% of producers said they were aware of the leaf scald disease, compared to only 6.6% who were not aware of it. More than 50% said they had known about the disease for at least 3 years (Table 3).

Table 3Knowledge of the disease by region

			Region			
Knowledge of the disease	Central	Kara	Maritime	plateau	Savannas	Total
Do you know this disease?						
No	3.3	1.6	0.0	1.6	0.0	6.6
Yes	9.8	16.4	34.4	11.5	21.3	93.4
How many years have you seen this disease in a rice field?						
do not know	0.0	4.9	1.6	0.0	0.0	6.6
less than 1 year	1.6	0.0	0.0	0.0	1.6	3.3
at least 2 years	3.3	8.2	8.2	4.9	8.2	32.8
at least 3 years	3.3	4.9	13.1	0.0	1.6	23.0
more _than_4_years	4.9	0.0	11.5	8.2	9.8	34.4
In which ecology did you find this disease?						
Don't know	0.0	1.6	0.0	0.0	0.0	1.6
Shallows	11.5	6.6	1.6	11.5	8.2	39.3
irrigated	0.0	0.0	29.5	1.6	0.0	31.1
Lowlands + irrigated + rainfed	0.0	0.0	0.0	0.0	1.6	1.6
Lowlands + rainwater	0.0	3.3	0.0	0.0	8.2	11.5

The disease is found more in the lowlands for nearly 40% of respondents. Some producers find that the disease is found in the lowlands, in irrigated areas as well as in rainfed rice cultivation. The latter represent 13.1% (Table 3).

The respondents were not able to give the name of the disease in French. Two producers, one in the prefecture of Tchamba and the other in the prefecture of Zio, gave local names, namely " kakpakmo " and " molou fio " which means both in Koussountou and in Ewe "the rice has burned". When asked how they managed to report the presence of the disease, most responded by describing the symptoms to their producer neighbor. Nearly 5% of the producers surveyed found that the damage caused by the disease was very significant. While 41% found that the damage was simply significant. The fifth (19.7%) did not pay particular attention to the disease (Table 4). When asked about the damage caused by leaf scald, 62.3% of producers thought that the disease reduced the yield and also reduced the quality of the grains. A small fringe (8.2%) of producers found that the disease caused damage without being able to name the damage caused by the disease (Table 4).

Table 4Perception of damage caused by the disease and its importance by region

		Regions				
Perception of damage	Central	Kara	Maritime	Plateau	Savanes	Total
Perception of the level disease damage						
indifferent	1.6	6.6	6.6	3.3	1.6	19.7
negligible	1.6	0.0	1.6	0.0	3.3	6.6
Not negligible	4.9	0.0	1.6	1.6	3.3	11.5
AVERAGE	1.6	1.6	9.8	1.6	1.6	16.4
important	3.3	6.6	14.8	4.9	11.5	41.0
Very important	0.0	3.3	0.0	1.6	0.0	4.9
Different type of damage caused by the disease						
Don't know	1.6	3.3	1.6	3.3	3.3	13.1
Other than yield reduction and grain quality losses	1.6	0.0	1.6	0.0	4.9	8.2
Yield drop	3.3	0.0	4.9	1.6	3.3	13.1
Yield drop + others	0.0	0.0	1.6	0.0	0.0	1.6
Yield reduction + loss of grain quality	6.6	14.8	23.0	8.2	9.8	62.3
Yield loss + loss of grain quality + others	0.0	0.0	1.6	0.0	0.0	1.6

When asked whether the disease was linked to agricultural practices and growing conditions, 59% of respondents answered in the affirmative, while more than a third (36.1%) did not know what to answer (Table 5).

For those who recognize that the disease would be related to agricultural practice, some producers found that it was due to the excessive supply of fertilizers, others on the other hand found that it should be the use of herbicides (figure 1). The majority of respondents think that it is due to drought, this is particularly the version that is most widespread in the Kara region and the central region.

Table 5Perception of the link between the disease and agricultural activities by region

Regions						
Perception of the link between the disease and agricultural activities	Central	Kara	Maritime	Plateau	Savanes	Total
Don't know	8.2	8.2	9.8	3.3	6.6	36.1
No	0.0	0.0	4.9	0.0	0.0	4.9
Yes	4.9	9.8	19.7	9.8	14.8	59.0

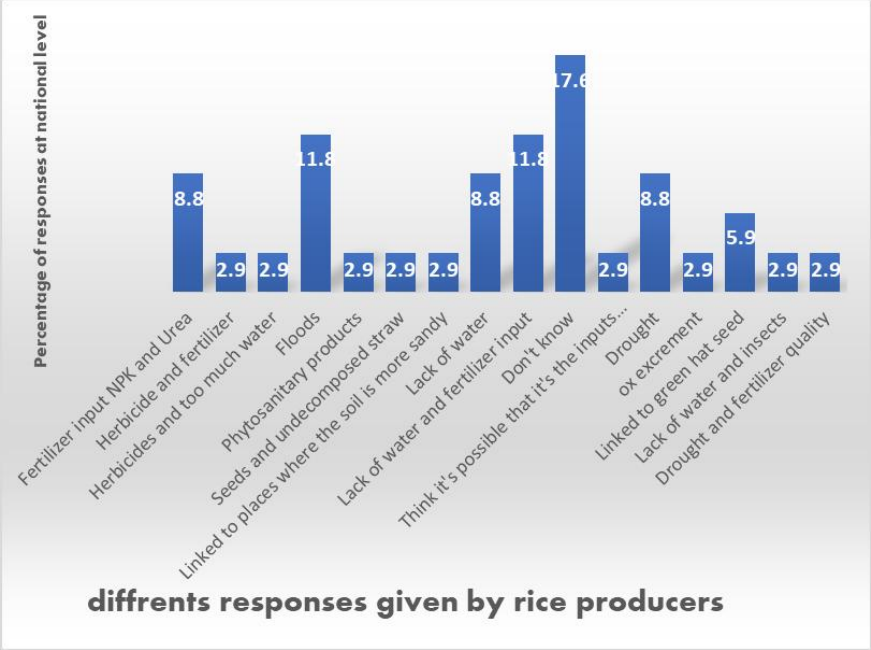

Figure 1Agricultural conditions that favor disease development

3.4 Method of disease control and prevention

In terms of disease control, about 31% of respondents said they had not taken any action to limit the damage caused by the disease, while 2% had reduced the amount of fertilizer and the same proportion said they had abandoned the affected plot. Nearly 20% said they had used a fungicide, half of whom combined the fungicide with an insecticide (figure 2).

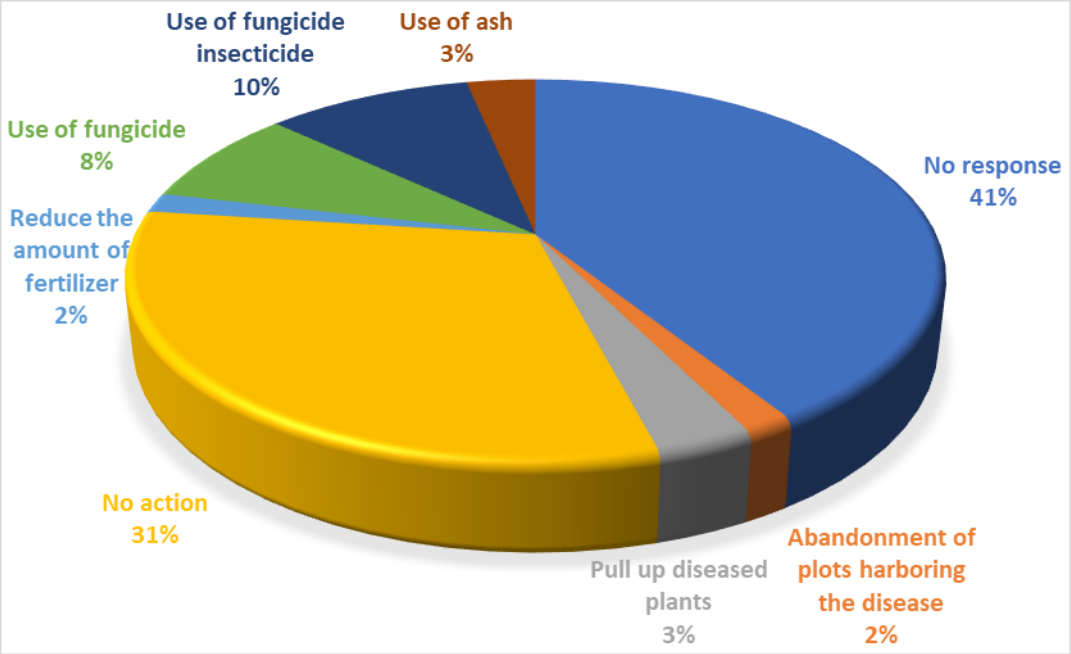

Figure 2Actions taken by producers to control the disease

Regarding the effectiveness of the control method, almost two thirds (60%) responded negatively (table 7).

Table 6Effectiveness of the method used to control the disease by region

	Central	Kara	Maritime	Plateau	Savannas	Total
effective	0.0%	4.5%	18.2%	9.1%	9.1%	40.9%
Not effective	4.5%	0.0%	36.4%	4.5%	13.6%	59.1%

Comparing the responses at the regional level, it is noted that there were more attempts to find a solution in the Maritime region. These attempts according to the producers (66.6%) were ineffective (table 7).

An attempt to find a solution on the agricultural level is to contact the technical services. On this level, two thirds of those surveyed say they have not contacted the agricultural technical services (extension services). For those who reported the disease symptoms encountered in the field, the maritime region comes first with a large number of producers having informed the agricultural technical services of the existence of the disease (table 8).

Table 7 Farmer requesting advice from agricultural technical services by region

Answer	Central	Kara	Maritime	Plateau	Savannas	General average
No	11.5%	11.5%	14.8%	9.8%	18.0%	65.6%
Yes	1.6%	6.6%	19.7%	3.3%	3.3%	34.4%

A third of the respondents (34%) contacted the agricultural technical services requesting for advices (table 8). About 37% of these farmers said they had no solution from the extension agents. In the same proportion, the agricultural technical agents advised the use of fungicides and these fungicides can be used in combination with insecticides according to 21% of the respondents. In 5% of cases, the agricultural technical services took samples for analysis and identification of the disease (figure 4)

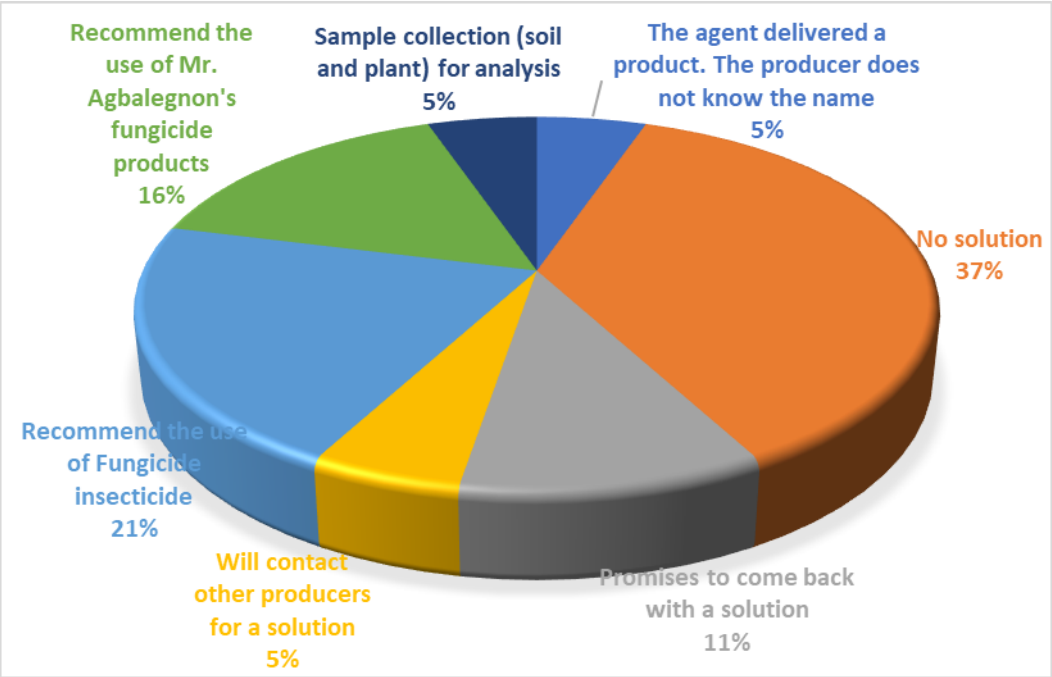

Figure 3The control method suggested by agricultural technical agents

4. Discussion

The producers surveyed are mostly adults, this also explains why most of them are married and living in a household of more than 3 people. These results were similar with farmers survey in Ghana (Amponsah, et al., 2018). The respondents mostly practice lowlands rice growing. These correspond to the characteristics of farmers in rice growing area in Togo showing that the, sample is well designed (MAPAH, 2020).

The level of experience of the respondents showed that they have already seen the symptoms of leaf scald either in their own field or in the field of other farmers. Their preferred method of identification of the disease is the observation. This method of disease identification is in line with other authors (Caniço, et al., 2021). The leaf scald disease is a common disease in rice fields as underline by (Nutsugah & Twumasi, 2001). The surveyed farmers were unable to give the name of the disease in their local language or in French although this disease has existed in West Africa since 1972 as underline by (Lamey & Williams, 1972). This can be explained by the fact that the disease is perhaps sporadic and that the extent of the damage is less as it was shown in the results of maritime region during the survey. For some rice farmers, in addition to the disease photos that was shown, it was necessary to visit their rice field to confirm their knowledge of the symptoms of leaf scald. Some producers thought that the state of the plants was part of the normal process of biological maturity.

About the cause of the disease, the answers were diverse proving the lack of knowledge of leaf scald. Only one producer was able to describe the disease from the begin to the end and the spread of this disease. This producer experiments a huge loss related to the leaf scald disease in the Kara region. The main causes in addition to the presence of the pathogen in the environment being drought, excessive nitrogen supply (Mondal, et al., 1986).

In terms of control, the survey revealed that there were very few effective control methods among both producers and the agricultural technical services. Even among extension agents, some have never heard of the disease. The lack of a solution for Togolese rice farmers is linked to a lack of knowledge of the leaf scald disease. This explains the fact that they suggest the combination of insecticide and fungicide to control the disease while the causal agent of leaf scald disease is a fungus.

5. Conclusion

The study is conducted to assess the knowledge of agricultural producers on the leaf scald disease and its spread across the country.

The majority of farmers have seen the symptoms of the leaf scald disease in their field which disease was a source of damage for nearly two thirds of the respondents. This damage cause by the leaf scald disease was recognized as significant for nearly half of the respondents but only a third of the respondents had attempts to use control method such as fungicides, insecticides and ash with more than 66% failure. Even agricultural services have lack of knowledge about the disease and its control methods.

In conclusion there is a lack of knowledge about the leaf scald disease of both the causes and the control method among Togolese rice producers and nearby technical support services. There is therefore recommended to conduct research to find an appropriate control method and build capacity of extension agents for its diffusion throughout the country for effective management of this disease.

References

Amadou, S., 2020. *Rapport attaque des plants de riz sur le site de la FAMETA,* Sokodé: ITRA.

Amponsah, S. K. et al., 2018. Assessment of rice farmers' knowledge andperception of harvest and postharvest losses in Ghana. *Cogent Food & Agriculture,* 4(1), pp. 1-14.

Caniço, A., Mexia, A. & Santos, L., 2021. Farmers' knowledge, perception and management practices of fall armyworm (Spodoptera frugiperda Smith) in Manica province, Mozambique. *NeoBiota,* Volume 68, pp. 127-143.

DSID, 2022. *Production national des cultures céréalières au Togo,* Lomé: MAEDR.

Filippi, M. C., Prabhu, A. S. & da Silva, G. B., 2005. Rice leaf scald and its control. In: G. Saint Anthony de Goiás, ed. *Circular technique 72.* s.l.:s.n.

IRRI, 2021. *Rice knowledge Bank.* [Online] Available at: www.knowledgebank.irri.org [Accessed 15 mars 2021].

Lamey, H. A. & Williams, R. J., 1972. Leaf scald of rice in west Africa. *Plant diease,* Volume 56, pp. 106-107.

MAPAH, 2020. *STRATEGIE NATIONALE DE DEVELOPPEMENT DE LA RIZICULTURE 2019-2030 (SNDR 2) Togo.* s.l.:s.n.

Mondal, A. H., Ahmed, H. U. & Miah, S. A., 1986. Effect of nitrogenon the developpment of leaf scald disease of rice. *Bangladesh Journal of Botanic,* 15(2), pp. 213-2015.

Mutiga, S. et al., 2019. Leaf Scald (Microdochium oryzae). *E-Guide for Rice Production in East Africa; Factsheet for Rice Diseases in East Africa*, p. 1.

Nutsugah, S. K. & Twumasi, J. K., 2001. FUNGAL DISEASES OF RICE IN GHANA: KNOWLEDGE AND RESEARCH NEEDS. In: S. S. a. R. J. (eds.), ed. *Major Fungal diseases of Rice Recent Advances.* s.l.:s.n., pp. 321-329.

Parkinson, V. O., 1980. Culture characteristics of the rice scald fungus, Rhynchosporium orizae. *trans. Br. mycol. Soc.,* 74(3), pp. 509-514.

Parkinson, V. O., Sivanesan, A. & Booth, C., 1981. The perfect state of the rice leaf scald fungus and the taxonomy of both the perfect and imperfect states. *Translations of the British Mycological Society,* 79(1), pp. 59-69.

Peregrine, W. T. H., bin Ahmad, K. & bin Yunton, B., 1974. Some Observations on Leaf Scald (Rhynchosporium oryzae Hashioka & Yokogi) in Brunei. *PANS Pest Articles & News Summaries,* 20(2), pp. 177-180.

Singh, S. A. & Gupta, P. K. S., 1982. Efficacy of some fungicides against leaf scald disease of rice. *Tropical Pest Management,* 28(4), pp. 412-415.

Tatagiba, S. D., DaMatta, F. M. & Rodrigues, F., 2016. Magnesium decreases leaf scald symptoms on rice leaves and preserves their photosynthetic performance. *Plant Physiology and Biochemistry,* 108(2016), pp. 49-56.

Tatagiba, S. D., DaMatta, F. M. & Rodrigues, F. A., 2016. Magnesium decreases leaf scald symptoms on rice leaves and preserves their photosynthetic performance. *Plant Physiology and Biochemistry,* 108(2016), pp. 49-56.

Turner, H. & Black, R., 2001. Rice leaf scald : pathogen biology and diversity. In: S. Sreenivasaprasad & R. Johnson, eds. *Major Fungal diseases of Rice Recent Advances.* s.l.:Kluwer Academic Publishers, pp. 307-319.

Yang, Z., 2021. Short Note On Leaf Scald. *Journal of rice reseach,* Volume 9, p. 253.