ການສຶກສາແນວພັນເຂົ້າທົນທານຕໍ່ແມງບົ່ວ ຢູ່ ສປປ ລາວ

ດຣ. ສຸລະພອນ ອິນທະວົງ[1], ຄຳບອນ ວົງສຸດທິ[2], ພູມີ ອິນທະປັນຍາ[3] ແລະ ດຣ. ຈອນ ຊິນເລີ[4]

ບົດຄັດຫຍໍ້

ການສຶກສາແນວພັນເຂົ້າທົນທານບົ່ວແບບຊາວນາມີສ່ວນຮ່ວມ ໄດ້ດຳເນີນຢູ່ເຂດທີ່ມີບົ່ວລະບາດຮຸນແຮງ ຢູ່ ບ້ານນາຮັ່ງນ້ອຍ, ເມືອງອາດສະພອນ, ແຂວງສະຫວັນນະເຂດ ໃນຊ່ວງລະດູຝົນປີ 2008 ແລະ 2009. ຮູບແບບການທົດລອງ Randomized Complete Block Design (RCBD) ປະກອບດ້ວຍ 2 ຊ້ຳ ແລະ 2 ຕົວຢືນ ຄື: ຕົວຢືນທົນທານ ແມ່ນໃຊ້ແນວພັນເຂົ້າໜຽວເມືອງງາ (ພັນພື້ນເມືອງ) ແລະ ຕົວຢືນອ່ອນແອ (ເຂົ້າໜຽວທ່າດອກຄຳ 11 (ພັນປັບປຸງ). ການສຶກສາແນວພັນເຂົ້າທົນທານຕໍ່ແມງບົ່ວໃນຄັ້ງນີ້ ລວມມີທັງໝົດ 48 ຊະນິດທົດລອງ, ຊຶ່ງໃນນັ້ນ ປະກອບມີແນວພັນພື້ນເມືອງ (11), ແນວພັນປັບປຸງ (24) ແລະ ສາຍພັນ (13). ແນວພັນ ແລະ ສາຍພັນເຂົ້າເຫຼົ່ານີ້ ແມ່ນໄດ້ຄັດເລືອກມາຈາກສູນຄົ້ນຄວ້າເຂົ້າ ແລະ ພືດເສດຖະກິດ (ນາພອກ, ນະຄອນຫຼວງວຽງຈັນ), ສູນປ້ອງກັນພືດ (ສາລາຄຳ, ນະຄອນຫຼວງວຽງຈັນ), ສູນຄົ້ນຄວ້າເຂົ້າ ແລະ ຂະຫຍາຍແນວພັນພືດທ່າຂະໂນ (ແຂວງສະຫວັນນະເຂດ) ແລະ ສູນຄົ້ນຄວ້າ ແລະ ຂະຫຍາຍແນວພັນເຂົ້າໂພນໆາມ (ແຂວງຈຳປາສັກ).

ຜ່ານການສຶກສາສະແດງໃຫ້ເຫັນວ່າ, ແນວພັນ ແລະ ສາຍພັນ ທີ່ມີຄວາມອ່ອນແອຕໍ່ການທຳລາຍຂອງບົ່ວ ກວ່າແນວພັນພື້ນເມືອງ ຄືດັ່ງນີ້: ຜົນການສຶກສາໃນ 2 ລະດູຕໍ່ເນື່ອງກັນ 2008 ແລະ 2009 ເຫັນວ່າ ມີພຽງແຕ່ 1 ແນວພັນເທົ່ານັ້ນ (ເຂົ້າໄກ່ນ້ອຍແດງ LG140124, ພັນພື້ນເມືອງ) ມີຄວາມທົນ ທານດີ (Resistant) ຕໍ່ການທຳລາຍຂອງແມງບົ່ວ (ເປີເຊັນການທຳລາຍຂອງບົ່ວ ຢູ່ໃນລະດັບຕ່ຳກວ່າ 5%). ພ້ອມດຽວກັນນີ້, ມີ 2 ແນວພັນປັບປຸງ (ທ່າດອກຄຳ 25 ແລະ ທ່າດອກຄຳ 42) ມີຄວາມທົນທານປານກາງ (Moderate resistant) ຕໍ່ການທຳລາຍຂອງແມງບົ່ວ (ເປີເຊັນການທຳລາຍຂອງແມງບົ່ວ ຢູ່ລະຫວ່າງ 6-15%). ນອກຈາກນັ້ນ, ແນວພັນ ແລະ ສາຍພັນສ່ວນຫຼາຍ ແມ່ນມີຄວາມອ່ອນແອປານກາງ (Moderate susceptible) ແລະ ມີຄວາມອ່ອນແອສູງ (Susceptible) ຕໍ່ການທຳລາຍຂອງແມງບົ່ວ ເຊິ່ງເປີເຊັນການທຳລາຍຂອງແມງບົ່ວ ສູງກວ່າ 51% ຂຶ້ນໄປ.

ແນວພັນປັບປຸງ (ທ່າດອກຄຳ 25 ແລະ ທ່າດອກຄຳ 42) ເຫັນວ່າ ມີຄວາມທົນທານປານກາງ ຕໍ່ການທຳລາຍຂອງແມງບົ່ວ, ແຕ່ແນວພັນດັ່ງກ່ວານີ້ ມີຄວາມສາມາດປົ່ງແໜ່ງທົດແທນຄືນໄດ້ ຈາກຕົ້ນທີ່ຖືກບົ່ວທຳລາຍ ໂດຍຜ່ານຂະບວນການວິວັດການສັບປ່ຽນ ແລະ ສ້າງຄະໂຣໂມໂຊມໃໝ່ (Translocating assimilated). ສະນັ້ນ, ແນວພັນດັ່ງກ່ວານີ້ ເຫັນວ່າ ມີຄວາມເໝາະສົມໃນພື້ນທີ່ໆມີການລະບາດຮຸນແຮງໃນແຕ່ລະປີ ເຊັ່ນ: ເມືອງພະລານໄຊ, ເມືອງອາດສະພັງທອງ ແລະ ເມືອງອາດ

ສະພອນ, ແຂວງສະຫວັນນະເຂດ. ເຖິງຢ່າງໃດກໍຕາມ, ການສຶກສາດ້ານຄວາມຫຼາກຫຼາຍຊີວະກຳມະພັນຂອງແມງບົ່ວ ແລະ ສາລີລະວິທະຍາຂອງຕົ້ນເຂົ້າ ເປັນຕົ້ນການປັບຕົວ ແລະ ລະດັບຄວາມທົນທານຂອງແນວພັນ ແລະ ສາຍພັນຕໍ່ແມງບົ່ວ ໃນລະບົບນິເວດວິທະຍາແຕກຕ່າງກັນ ມີຄວາມສຳຄັນ ແລະ ຈຳເປັນຈະຕ້ອງໄດ້ສືບຕໍ່ສຶກສາໃນຂັ້ນຕໍ່ໄປ ເພື່ອເປັນບ່ອນອີງໃນການວາງແຜນການປັບປຸງແນວພັນໃນ ສປປ ລາວ.

ຄຳສັບຫຼັກ: *ສະຫວັນນະເຂດ, ແມງບົ່ວ, ແນວພັນ ແລະ ສາຍພັນ.*

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Development of Gall Midge Resistant Lowland Rice Varieties in Lao PDR

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Abstract

The Asian rice gall midge (RGM), *Orseolia oryzae* (Wood-Mason) is a serious pest of rice in most of Asia including Laos. Most improved varieties currently being recommended in Laos are susceptible to gall midge damage, and it is a major yield constraint in wet-season lowland rice crops in parts of Central and Southern Laos. This study was undertaken as part of a program for the development of gall midge resistant improved varieties. An evaluation of relative gall midge susceptibility of traditional lowland varieties, improved lowland varieties, and breeding lines was carried out during the 2008 and 2009 wet-seasons, in a gall midge "hot spot" in Nahang-Noi village, Atsaphone district of Savannakhet province. A total of 48 entries (comprising 11 traditional varieties, 24 improved varieties and 13 promising lines) were assessed for gall midge resistance. The entries included a resistant check (the traditional variety *Muang Nga*), and a known susceptible check (the Lao improved variety, *Tha Dok Kham 11 (TDK11)*. The varieties and breeding lines were sourced from the National Rice and Cash Crops Research Center and the Plant Protection Center near Vientiane Capital, the Thasano Rice Research and Seed Multiplication of Savannakhet Province, and the Phone Ngam Rice Research and Seed Multiplication Center of Champassak Province.

The results showed that compared with local varieties, the improved varieties and promising lines were generally more susceptible to gall midge, with a wide range of levels of infestation. In the 2008 and 2009 wet-seasons, only one entry, the local variety, *Kai Noi Deng* (LG14024), exhibited resistance to gall midge damage, with less than 5% of silver shoots; a further two entries (*TDK25* and *TDK42*) were classified as being moderately resistant (with 6-15% silver shoots); the remaining 45 entries were classified as susceptible, with more than 51% of silver shoots.

The two improved varieties, *TDK25* and *TDK42* exhibited a relative lower level of gall midge susceptibility than other improved varieties, with both varieties showing an ability to compensate for gall midge damage. These varieties might therefore be more appropriate than varieties currently being used, in this locality and in other areas reporting high levels of gall midge damage throughout the country, including the districts of Phalanxay, Atsaphangthong

and Atsaphone in Savannakhet province. However, the assessment of potential of these varieties needs to be undertaken in different areas with chronic gall midge problems, as well as under the different growing conditions in the lowland environment throughout the country.

Key words: *Savannakhet, gall midge, varieties, and breeding lines.*

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Introduction

The Asian rice gall midge (RGM), *Orseolia oryzae* (Wood-Mason) (Diptera: Cecidomyiidae) is a serious pest of rice in Asia, including Laos (Inthavong 1999, Harris *et al*., 2003). It was first referred to in Laos by Hill (1975). In the mid 1990s, internationally gall midge damage in rice crops was estimated to cause annual losses of at least US$ 550 million (Herdt 1996), while more recent estimates for eastern and southern India alone were estimated at US$80 million annually (Mathur *et al*., 2004).The gall midge maggots feed internally on the growing point of the tillers, converting them to sterile galls called 'silver shoots' or 'onion leaf', which Lao farmers easily recognize and call "*bua*". Host plant resistance is the single most effective means of controlling this Dipteran pest of rice (Dale 1994; Katiyar *et al*., 1995 and Bentur *et al*., 1996). This is the approach being used in Laos.

In Laos, approximately 80% of total area used for rice cultivation (approximately 870,000 ha in 2009) is planted to high-yielding improved varieties (DOA 2009). However, most of the recommended improved varieties are more susceptible to rice gall midge damage than the local varieties that have been used until recently (Lao-IRRI 2001). In India, where gall midge has also been a problem, the incidence of the pest has also increased with the widespread cultivation of dwarf and high-yielding cultivars (Krishnaiah 2004).

The systematic screening and evaluation of rice varieties (both improved and local varieties) in Laos, to identify gall midge resistant donors, was initiated in 1998-99. In the early studies, only one local glutinous, *Muang Nga*, was identified as having a high level of resistance (with damage to less than 5% of tillers). This variety was then used in the national program which commenced in 2006, aimed at the development of gall midge resistant varieties. Although significant advances have been made in the development of breeding lines with improved resistance to gall midge, no improved rice varieties with gall midge resistance have been released as of 2010.

In the wet-seasons of 2008 and 2009, a detailed study of the relative resistance of breeding lines and improved varieties to gall midge, was undertaken in the gall midge 'hot spot' Nahang-noi village in Atsaphone district of Savannakhet province. An on-farm, farmer participatory approach has been used in the study, which is scheduled to continue through until the end of 2011. Preliminary results of the study are presented in this report.

Materials and Methods

A total of 48 entries (composing 11 traditional varieties, 24 improved varieties and 13 promising lines) were assessed for gall midge resistance. The entries included a resistant check (the traditional variety *Muang Nga*) and a known susceptible check (the Lao Improved variety *Tha Dok Kham 11 (TDK11)*. The varieties

and breeding lines were sourced from the National Rice and Cash Crops Research Center and the Plant Protection Center near Vientiane Capital, the Thasano Rice Research and Seed Multiplication Center of Savannakhet province, and the Phon Ngam Rice Research and Seed Multiplication Center of Champassak province (Table 1). The experimental design was based on two replications.

Using 120 x 220 cm plots and 50 hills per test cultivar, individual 25 day old seedlings were transplanted into hills using a 20 x 20 cm hill and row spacing. All plots received a fertilizer application the equivalent of 60:15:15 kg/ha of $N:P_2O_5:K_20$, with part of the N being applied as split applications at 25 and 45 days after transplanting. In the 2008 wet-season, sowing took place on 13 June and

Plate 1. *Layout of experiment for evaluation of gall midge resistance in Atsaphone district, Savannakhet province.*

Plate 2. *Farmers, extension workers and rice breeders evaluating the performance of varieties and breeding lines for gall midge resistance.*

Plate 3. *Visiting international researchers, Lao national researchers and extension workers, at the experimental site in Atsaphone district, Savannakhet province.*

Plate 4. *Farmers, district and provincial collaborators with visiting international scientists at the gall midge experimental site in Savannakhet province.*

transplanting on 7 July, while in 2009 the dates for these operations were on 10 June and 5 July, respectively. In both seasons, the timing of sowing and transplanting were approximately the same as for farmer's rice cropping activities in the area.

The test varieties were evaluated in terms of relative (%) plant and tiller damage (silver shoots) from 25 hills in each variety test plot and replication. The levels of infection and damage were measured 60 days after transplanting (DAT). All silver shoots were put into vials containing 70% ethyl alcohol for laboratory evaluation and characterization (Resissig *et al*., 1986). In addition, the general observations such as characteristics of the rice plants in each test cultivar, agricultural practices and climate, were also recorded at weekly interval.

Two methods of evaluating gall midge damage were used (i) the formula of Hidaka and Widiarta (1986) and, (ii) the Standard Evaluation for Resistant developed by Heinrichs *et al*., (1985). The data was entered onto electronic Excel spreadsheet for statistical analysis.

Results and Discussion

Relative susceptibility to gall midge of rice varieties and breeding lines

Differences in relative levels of susceptibility to gall midge infestation and damage exist among the varieties and breeding lines which were evaluated in the 2008 and 2009 wet-seasons (Table 1). Generally, the Lao recommended improved, introduced and promising lines were more susceptible and showed a wide range of infestation, relative to the local varieties that were assessed.

In the 2008 wet-season, in the total of 48 entries assessed, there were two classified as resistant (R) to gall midge (with less than 5% silver shoots), these two entries being the local variety *Kai Noi Deng* (LG14024) and the improved variety *Chao V9*. Seven entries were classified as being moderately resistant (MR), with between 6 to 15% silver shoots. Of these, four were local varieties (*Kai Noi Lai* (LG14020), *Kai Noi Leung* (LG14030), *Muang Nga* (LG14087) and *Muang Nga* (LG14088)) and three improved varieties (*TDK25, TDK42* and *Chao V8*). Twenty-one entries were classified as being moderately susceptible (MS) with 16-50% of silver shoots. Twelve of the 48 entries were classified as being susceptible (S) with the incidence of silver shoots exceeding 51%. In addition, five entries were found to be seriously affected by rice blast, Pyricularia oryzae - these were two local varieties, *Chao Deng 2* and *Kor Deo*; two improved varieties, *NTN1* and *TDK5*; and the breeding line *IR69502-6* (Table 2).

In the 2009 wet-season, the 48 entries screened for gall midge resistance in the 2008 wet-season were screened in the same locality. Two entries were classified as resistant these being the same local variety that was resistant in 2008, *Kai Noi Deng* (LG14024) and the improved variety *TDK11*. Twelve entries were assessed as moderately resistant, 25 entries were assessed as moderately susceptible, and 5 were susceptible (Table 1). As in the 2008

wet-season, the entries were also assessed for susceptibility to rice blast, with four being seriously affected by the disease, these being *Ta Khet15*, *Muang Nga* (LG14088), *HH1-B-B-B-4-1-1-1*, and *B-B-SK-B-B-B* (Table 2).

Over the two growing seasons, only one entry, the local variety *Kai Noi Deng* (LG14024), was classified as being resistant to gall midge (with less than 5% of silver shoots) in both years. Two entries, *TDK42* and *TDK25*, were classified as being moderately resistant in both years, while 13 entries (*TDK9, TDK7, IR69502-1, Hom Nang Nuan, TDK1, TDK3, TDK6, HH1-B-B-B-1-1-1-B-5-1, HH1-B-B-B-3-1-1, TSN5, Chao V4, TSN4,* and *Chao Hom Savan*) were classified as being moderately susceptible in both seasons. Two entries, *TDK49* and *Chao V4*, were classified as being highly susceptible to gall midge in both 2008 and 2009, and are not recommended for further development or distribution in rice growing areas where gall midge infestation is a chronic yield constraint. In addition, the entries highly susceptible to blast are also not recommended for further development or distribution, these entries being *Chao Deng2, Nam Tan1* (NTN1), *Tha Dok Kham5* (TDK5), *IR69502-6, Kor Deo Ta-Khet15, HH1-B-B-B-4-1-1-1,* and *B-B-SK-B-B-B* (Table 2).

Relationship between gall midge damage and climate

Differences in the incidence of gall midge between the 2008 and 2009 wet-seasons in the study report, might have reflected be due to environmental factors.

Overall, gall midge infestation in the 2008 wet-season was lower compared than in 2009, both in the study and in farmer's fields. Although total rainfall in both seasons was similar, the commencement of the wet-season rains was later in 2009 than in 2008. In 2008, the first rains came in early May, allowing rice to be transplanted between the end of May and mid-June, whereas in 2009 transplanting was completed in late July. Most serious gall midge infestation and damage occurs when rains make the adults active (Pathak *et al*., 1994). The gall midge populations are less abundant in years when the cropping season is preceded by the warm and dry conditions. Hidaka *et al*., (1996) also observed that seasonal fluctuation of gall midge populations were closely related to rainfall, with overcast skies and drizzling rains favoring the rapid build-up of the gall midge population.

It is generally acknowledged and there is related evidence, that early planting of wet-season rice crops can help reduce the potential impact of gall midge, as the gall midge population on alternative host plants does not get sufficient time to increase to levels capable of causing significant infestation and damage (Inthavong 1999; Lao-IRRI 2001). When there is a delay in the opening monsoon rains that delay planting, gall midge damage can be significant. In central and southern Laos, peak gall midge activity is between the last week of August and the first week of October.

Gall midge biotypes

Bentur *et al*., (2004) noted that an important factor influencing host-plant resistance is the genetic variation in gall midge populations from different geographic locations. This intraspecies variation is now well characterized and is reflected in the recognition of a number of gall midge biotypes (Pasalu *et al*., 2004). The presence or development of pest populations called biotypes, capable of overcoming host plant resistance, is the main limitation of widespread and continued cultivation of such specific cultivars (Kalode *et al*., 1989). Katiyar *et al*., (2000) reported that gall midge larvae and pupae collected from Phalanxay district of Savannakhet province is gall midge biotype1 (*Gm1*), which belongs to the same group found in Guangdong province of Southern China and Manipur State of Northeast India, while in Indonesia and Sri Lanka it was found to be found *Gm2*, while in Thailand and Vietnam it was *Gm3*. Studies on the reaction of rice varieties to gall midge populations in different parts of Thailand have suggested possible biotype variation within the country (Tayathum *et al*., 2004). For example, the gall midge population from the provinces of Nan and Phrae were clustered into one group, which differed in their reaction with respect to the Thai rice varieties *RD4* and *RD9*. At the level of insect-host plant interactions, such variation in reactions reflects diversity in the resistance mechanisms (Kalode 1980 and Bentur *et al*., 2004). Geographic differences in varietal reaction have been noted with respect to rice brown planthopper (BPH), *Nilapartvata lugens* (Seshu and Kauffman 1980), whitebacked planthopper (WBPH), *Sogatella furcifera*, and green leafhopper, *Nephotetix viruscens* (Pathak *et al*., 1982).

Studies on the genetics of gall midge resistance show that resistance to rice gall midge is primarily governed by single dominant genes (Chaudhaly *et al*., 1985; Kumar *et al*., 1998, 1999, 2000 and 2005, and Shrivastava *et al*., 2003). The genes for gall midge resistance for biotypes *Gm1*, *Gm2, Gm3, Gm4, Gm5, Gm6, Gm8*, and *Gm9*, have been found in India and China (Kumar *et al*., 2005). The discovery of new genes and their deployment in new breeding lines provides some insurance against the possible emergence of new biotypes and possible resulting breakdown of resistance (Kumar *et al*., 2005).

Future research on the development of gall midge resistant varieties

The ultimate objective is to develop improved rice varieties with resistance to the gall midge biotypes found in the Lao PDR. Possible differences in biotypes in different parts of the country will need to be examined. DNA typing has only been carried out on one sample from the central agricultural region. As most of the rice growing and consumed in the Lao PDR is glutinous, genes for resistance will have to be incorporated into recommended glutinous lines, rather than relying on the introduction and distribution of varieties with known resistance, but which are non-glutinous rice. The systematic screening of varieties and breeding lines undertaken in this study, will help in the identification of sources of resistance to gall midge biotypes found in Lao PDR.

Table 1: Reaction of varieties and promising lines to gall midge infestation during the 2008 and 2009 wet seasons in Atsaphone district, Savannakhet province.

No. entry	Test varieties	Type of variety[1]	Crop maturity[2]	Endos-perm Type[3]	Reaction to gall midge[4]	
					2008 wet-season	2009 wet-season
1	*Tha Dok Kham9* (TDK9)	IV	M	GL	MS	MS
2	*Tha Dok Kham7* (TDK7)	IV	M	GL	MS	MS
3	*Tha Dok Kham4* (TDK4)	IV	M	GL	MS	S
4	IR69502-1	PL	M	GL	MS	MS
5	*Chao Deng2*	LV	S	NGL	BL	MS
6	*Home Nang Nuan*	LV	M	GL	MS	MS
7	*Tha Dok Kham49* (TDK49)	IV	M	GL	S	S
8	*Tha Dok Kham1* (TDK1)	IV	M	GL	MS	MS
9	*Tha Dok Kham3* (TDK3)	IV	M	GL	MS	MS
10	*Kai Noi Deng* (LG14024)	LV	M	GL	R	R
11	*Tha Dok Kham42* (TDK42)	IV	M	GL	MR	MR
12	*Tha Dok Kham33-9* (TDK33-9)	IV	M	GL	S	MS
13	*Tha Dok Kham10* (TDK10)	IV	M	GL	MS	MR
14	*Nam Tan* (NTN1)	IV	M	GL	BL	MS
15	*Ta Khet15*	LV	M	GL	S	BL
16	*Tha Dok Kham6* (TDK6)	IV	M	GL	MS	MS
17	*Tha Dok Kham5* (TDK5)	IV	S	NGL	BL	MS
18	IR69502-6	PL	M	GL	BL	MS
19	*Chao Deng1*	LV	S	GL	S	MR
20	*Tha Dok Kham8* (TDK8)	IV	M	GL	S	MR
21	*Kai Noi Lai* (LG14020)	LV	M	GL	MR	MS
22	*Kai Noi Leung* (LG1403)	LV	M	GL	MR	S
23	*Tha Dok Kham11* (TDK11)	IV	M	GL	MS	R
24	*Tha Dok Kham25* (TDK25)	IV	M	GL	MR	MR
25	*Muang Nga* (LG14088)	LV	M	GL	MR	BL
26	*Muang Nga* (LG14087)	LV	M	GL	MR	MS
27	HH1-B-B-B-4-1-1-1	PL	M	GL	MS	BL
28	B-3-2-2-1	PL	M	GL	S	MR
29	21-1-1-B-SK-B	PL	M	GL	S	MS
30	*Nga Xang*	LV	S	GL	S	MS
31	B-B-SK-B-B-B	PL	M	GL	MS	BL
32	HH1-B-B-B-1-1-1-B-5-1	PL	M	NGL	MS	MS
33	HH1-B-B-B-3-1-1	PL	M	GL	MS	MS
34	*Chao V8*	IV	M	GL	MR	MS
35	*Tha Sa No5* (TSN5)	IV	M	GL	MS	MS
36	*Tha Sa No7* (TSN7)	IV	M	NGL	MS	S
37	*Tha Sa No2* (TSN2)	IV	M	GL	S	MS
38	*Chao V4*	IV	M	NGL	S	S
39	*Tha Sa No4* (TSN4)	IV	M	GL	MS	MS
40	*Chao V1*	IV	M	GL	S	MS
41	*Tha Sa No8* (TSN8)	IV	M	NGL	S	MR
42	*Tha Sa No3* (TSN3)	IV	M	NGL	MS	MR
43	*Chao Hom Savan*	IV	M	GL	MS	MS
44	*Chao V9*	IV	M	GL	R	MS
45	*Tha Sa No1* (TSN1)	IV	M	GL	MS	MR
46	*Tha Sa No6* (TSN6)	IV	M	GL	MS	MR
47	*Kor Deo*	LV	M	GL	BL	MR
48	*Khao Kam*	LV	L	GL	NA	MR

Note: [1]type of variety: IV-improved variety, LV-local variety, PL-promising line. [2]Crop maturity: S-short (110-125 days), M-medium (130-150 days), L-long (>151). [3]Endosperm Type: GL-glutinous rice, NGL-non-glutinous rice.[4]Reaction to gall midge: R-resistant (1-5% silver shoots), MR-moderate resistant (6-15% silver shoots), MS-moderate susceptible (16-50% silver shoots), S-susceptible (>51% silver shoots), BL-rice blast, *Pyricularia oryzae*. NA-no data due to the seeds were not germinated.

Table 2. Entries classified as susceptible to rice blast, *Pyricularia oryzae* in the 2008 and 2009 wet-seasons in Atsaphone district, Savannakhet province.

No. of entry	Entries susceptible to blast in the 2008 wet-season	Entries susceptible to blast in the 2009 wet-season
1.	*Chao Deng2*	*Ta Khet15*
2.	*Nam Tan1* (NTN1)	*Muang Nga* (LG14088)
3.	*Tha Dok Kham5* (TDK5)	HH1-B-B-B-4-1-1-1
4.	IR69502-6	B-B-SK-B-B-B
5.	*Kor Deo*	

Conclusions

The results of the 2008 and 2009 wet-season studies on the relative susceptibility of the different varieties currently being recommended for the rainfed lowland rice environment in Laos, have implications for current varietal recommendations in some areas. The recently released improved varieties TDK25 and TDK42, which were assessed as having moderate levels of resistance to gall midge infection and damage, also demonstrated that they can compensate for gall midge damage. This suggests these two varieties might be more appropriate than varieties currently grown in the locality of the study (which is recognized as a gall midge 'hot spot'), and also in other areas of the country with reported chronic high levels of gall midge damage in wet-season lowland rice crops, especially the districts of Phalanxay, Atsaphangthong and Atsaphone in Savannakhet province.

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