Journal of Applied Biosciences 50: 3501– 3511

ISSN 1997–5902

Diagnosis and importance of rice yellow mottle disease epidemics in Niger republic.

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Originally Submitted on 23rd September 2011. Published online at www.m.elewa.org on February 27, 2012.

ABSTRACT

Objectives: To diagnosis *Rice Yellow Mottle Virus* (RYMV) disease and evaluate its importance (geographical distribution, incidence, yields losses and virus population structure) in Niger Republic.
Methodology and Results: A phytosanitary survey of all irrigated perimeters indicated that *Rice Yellow Mottle Virus* was present in most rice fields of Niger Republic with an average incidence of 5 to 90 %. In some fields, the incidence was very high (60 to 90 %) but in others, it was less than 30 %. The yield losses calculated in 4 rice sites under severe attack were between 35 and 71 %. The pre-characterization of isolates collected during the survey revealed diversity at both serological and pathological levels, and most importantly a significant proportion of resistance breaking (RB) isolates. A study on (Poacea and Cyperaceous) suggested that the species *Laersia hexandra, Paspalum emplectens, Echinochloa colona, Panicum repens, Cynodon dactylon, Cyperus rotondus, Kylinga sp*. and *Cyperus sp*. were hosts reservoirs of R*ice Yellow Mottle Virus* in Niger environment. Their role in disease propagation was discussed.
Conclusion and application: These results reporting the importance of the disease and the presence of RB isolates make necessary complementary studies with a large set of Niger-RYMV isolates and varieties.
Key words: *Niger-RYMV, disease incidence, yields losses, hosts reservoirs, Resistance breaking isolates.*

INTRODUCTION

In Niger republic, rice is the main source of calories for the urban populations bordering the Niger River. It is the most cultivated cereal after millet and sorghum (PAFRIZ, 2006). Its annual production is 110,000 tons of paddy (approximately 66.000 tons of white rice), which represents a third of the national consumption (PAFRIZ, 2006; PAFRIZ/AGRHYMET, 2006). Therefore, the national production does not meet the requirements of rice consumption. Efforts are thus made to increase its production. However, the rice cultivation is seriously affected by limiting factors such as rice yellow mottle disease (Kouassi *et al.* 2005). This disease caused by *Rice yellow Mottle virus* (RYMV), *Genus Sobemovirus,* is specific and emergent to the African continent (Sere *et al.* 2008). It was first discovered in year 1966 in Kenya by Bakker 1974 and thereafter observed in most Africa rice growing environments (Traore *et al*. 2001; Kouassi *et al.* 2005, Sere *et al.* 2008; Ndikumana *et al.* 2011). It is transmitted by insects-vectors and by contact during the cultural practices (Abo *et al.* 2000; Traore *et al.* 2006 a). The rice yellow mottle disease was first observed in Niger republic by Rechkaus and Adamou twenty five years ago (Kouassi *et al.* 2005). As in many other countries of West Africa, the disease incidence increased dramatically in the early nineties following rice growing intensification (Traore *et al.* 2009). Since then however, its economic importance in Niger remains unknown. No systematic surveys have been conducted to assess the geographical distribution of the disease, the extent of the yield losses and the virus variability. Similarly, no information is available on environmental factors which modulate the epidemics in Niger Republic. Therefore it was essential to undertake a comprehensive survey of RYMV incidence in the rice ecologies of Niger Republic in order to answer of the following key questions: What is the importance of rice yellow mottle disease in Niger Republic? Which species weeds are likely to play a role in the epidemiology of the virus disease? What are the serological and biological characteristics of its pathogenic agent?

MATERIALS AND METHODS

Zone of study: The zone of study included the two borders of the Niger River as well as the modern rice cultivation around the Lake Chad (Figure 1). It approximately covers 40.000 ha, distributed in thirty five (35) rice perimeters or sites

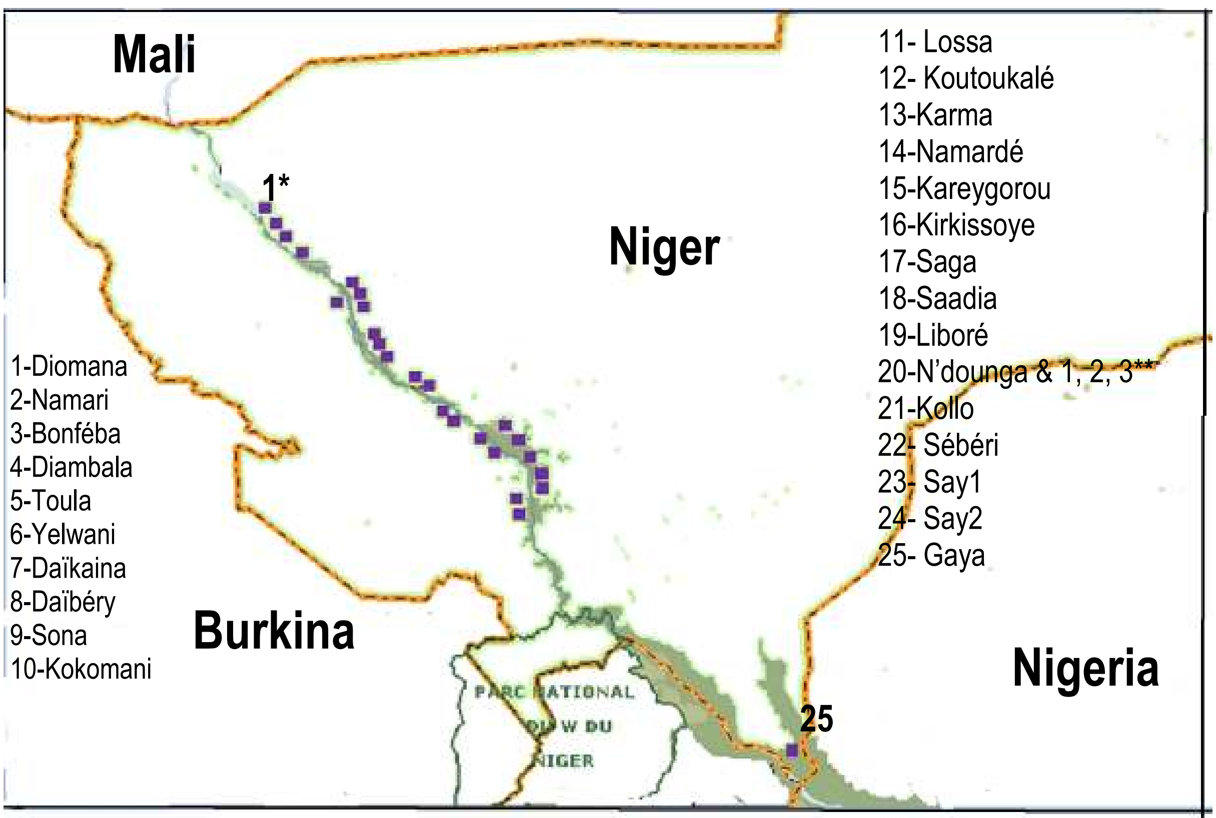

Figure 1: Rice perimeters prospected in Niger
*Sites names in order (1 to 25) without site of Diffa (Eastern Niger); **4 sites of N'dounga (5 Km around)

Evaluation of disease importance: The assessment of the disease incidence was made during surveys of all irrigated rice perimeters. The incidence was estimated by counting the total numbers of plants and the number of infected ones on three lines taken randomly in each field. Plots of one square meter (1 m^2) were defined in healthy and infected patches in the sites under strong attack at Sébéri, Kollo, Liboré and Kirkissoye, in order to calculate yield losses due to the disease. The yield loss (Pd) was calculated by applying the formula

Pd = (Pt x I)/100, where (I) represents the percentage of disease incidence, (Pt) the potential loss representing the percentage of yield reduction deduced from the production of healthy and infected square meters.

Samples collection and analysis: Samples of rice and *Graminaceous adventitious* (Poacea and Cyperaceous) showing typical yellowing and mottling symptoms (Figure 2) were collected, taking care to avoid any contact between leaves. These samples were then set in an icebox and transferred to the AfricaRice Plant Pathology laboratory where they were analyzed in containment conditions to comply with the biosecurity rules.

A B

Figure 2: Symptoms of Rice Yellow Mottle Disease, A = detail of symptoms (Photo Y. Sere), B = Symptoms in a rice field at Saga in Niger (Photo S. Issaka)

To test the presence of RYMV in the samples, the ACP-ELISA (Antigen Coating Plate -Enzyme Linked Immuno-sorbent Assay) test was first carried out using polyclonal antibodies manufactured by AfricaRice (Sere *et al.* 2007; Afolabi *et al.* 2009). The samples were also propagated by mechanical inoculation of 21 days old seedling of two resistant varieties (Gigante and Tog 5681) and two susceptible ones (IR64 and Bouake 189). The 21 days old seedlings were inoculated by rubbing their leaves with inoculums prepared by grounding leaves showing the typical RYMV symptoms in a phosphate buffer (rate: 1 g of leave for 10 ml of buffer solution). Carborundum was added to the inoculums, as abrasive. (N'Guessan *et al.* 2001; Onasanya *et al.* 2006). The symptoms were evaluated 14 and 21 days after inoculation (JAI) using the scale severity 1-9 (Konaté *et al.* 1997) (where 1 means the lack of symptoms and 9 leave necrosis).Ten polyclonal antibodies products by Africa rice center were used to assess the serological diversity of 66 isolates according to the method described by Sere *et al.* (2007).

RESULTS

Distribution and importance of rice yellow mottle disease in Niger Republic: Investigations and compilations of ONAHA's (Rice perimeters management office) statistical data made it possible to describe characteristics of the 30 perimeters visited (Table 1). It appeared that 6 rice varieties were cultivated in the 30 irrigated perimeters out of which IR 1529-680-1, WITA8 and Guiza are the most popular. IR1529-683-1 was the most widespread cultivar since it was found on all the sites. Bassiroumo, a variety derived from IR1529-683-1, occupied nearly 80 % of the emblazed perimeters of Tillabéry's area (Western of Niger), the principal producing rice zone. The RYMV disease was present on cultivated rice, wild rice and many Graminaceous adventitious (Table 2).

Table 1: Profile of rice perimeters prospected in Niger

S/N	Sites	Farm[21]	GC[2]	Agro-ecology	Creation	Varieties cultivated					
1	Diomana	716	2	Northern-sahelian	1991	IR1529	Kass.*	Bass. **			
2	Bonfeba	673	2	Northern-sahelian	1991	IR1529	Kass.*		WITA8		
3	Namari	1774	2	Northern-sahelian	1980	IR1529	Kass.*	Bass.*			
4	Diambala	1580	2	Northern-sahelian	1983	IR1529	Kass.*	Bass.*			
5	Yelwani	297	2	Typical-sahelian	1984	IR1529		Bass.*	WITA8		
6	Toula	720	2	Typical-sahelian	1974	IR1529	Kass.*	Bass.*			
7	Daikaina	325	2	Typical-sahelian	1964	IR1529	Kass.*				
8	Daiberi	572	2	Typical-sahelian	1985	IR1529	Kass.*				
9	Kokomani	150	2	Typical-sahelian	1970	IR1529	Kass.*				
10	Sona	346	2	Typical-sahelian	1974	IR1529	Kass.*				
11	Lossa	433	2	Typical-sahelian	1970	IR1529			WITA8	GUIZA	
12	Koutoukale	720	2	Typical-sahelian	1934	IR1529	Kass.*				
13	Lata	449	2	Typical-sahelian	1990	IR1529			WITA8	GUIZA	
14	Karma	413	2	Southern-sahelian	1971	IR1529	Kass.*				
15	Namarde	484	2	Southern-sahelian	1984	IR1529			WITA8	GUIZA	
16	Karegorou	437	2	Southern-sahelian	1964	IR1529			WITA8		
17	Kirkisoye	334	2	Southern-sahelian	1966	IR1529			WITA8		
18	Saadia	332	2	Southern-sahelian	1973	IR1529			WITA8		local
19	Saga	1081	2	Southern-sahelian	1966	IR1529			WITA8	GUIZA	
20	Libore	900	2	Southern-sahelian	1973	IR1529			WITA8	GUIZA	
21	N'Dounga 1	775	2	Southern-sahelian	1973	IR1529			WITA8	GUIZA	
22	N'Dounga 3	1047	2	Southern-sahelian	1975	IR1529			WITA8	GUIZA	
23	N'Dounga	?	2	Southern-sahelian	1991	IR1529			WITA8	GUIZA	
24	Kollo	?	2	Southern-sahelian	1984	IR1529			WITA8	GUIZA	
25	Say-2	330	2	Southern-sahelian	1989	IR1529			WITA8	GUIZA	
26	Say-1	350	2	Southern-sahelian	1945	IR1529			WITA8	GUIZA	
27	Seberi	1100	2	Southern-sahelian	1979	IR1529			WITA8	GUIZA	
28	Tara	275	2	Northern-sudanian	1978	IR1529			WITA8		local
29	Gaya	325	2	Northern-sudanian	1990	IR1529			WITA8		local
30	Diffa	?	1	Typical-sahelian	1974	IR1529					local
Number of perimeters						30	11	5	19	12	4
Frequency (in percent)						100	37	17	63	40	13

[1] number of farmers; [2]number of growing cycles per year; * Kassoummo; ** Bassiroumo

Table 2: Inventory of RYMV samples collected in Niger

Agro-ecology	Site number	Samples number		Total samples
		Rice	Graminaceous	
Northern-sahelian	4	25	42	67
Typical-sahelian	9	81	71	152
Southern-sahelian	15	124	157	281
Northern-sudanian	2	9	13	22
Total	30	239	283	522

Table 3: Incidence of RYMV in Niger rice perimeters

S/N	Locality	Agro-ecology	Incidence (%)		Isolates obtained		
			Humid season	Dry season*	Rice	Graminaceous	Total
1	Bonfeba	Northern-sahelian	10-55	-	2	3	5
2	Diomana	Northern-sahelian	10-30	-	3	0	3
3	Diambala	Northern-sahelian	10-20	-	2	0	2
4	Namari	Northern-sahelian	10-45	-	2	0	2
5	Yelwani	Typical-sahelian	5-60	-	5	0	5
6	Toula	Typical-sahelian	10-35	-	6	4	10
7	Daiberi	Typical-sahelian	10-30	5-20	12	0	12
8	Daikaina	Typical-sahelian	10-35	5-15	7	1	8
9	Kokomani	Typical-sahelian	10-45	-	2	3	5
10	Sona	Typical-sahelian	5-20	-	8	0	8
11	Lossa	Typical-sahelian	5-15	-	1	6	7
12	Lata	Typical-sahelian	5-30	-	1	0	1
13	Koutoukale	Typical-sahelian	5-40	-	8	3	11
14	Karma	Southern-sahelian	5-25	-	2	3	5
15	Karegorou	Southern-sahelian	10-50	5-20	12	4	16
16	Namarde	Southern-sahelian	5-20	5-15	4	1	5
17	Kirkisoye	Southern-sahelian	20-70	-	9	3	12
18	Saga	Southern-sahelian	20-65	5-10	6	0	6
19	Libore	Southern-sahelian	20-90	5-10	5	3	8
20	Saadia	Southern-sahelian	5-20	5-20	2	0	2
21	N'Dounga	Southern-sahelian	15-25	5-15	4	1	5
22	N'dounga 1	Southern-sahelian	10-40	-	4	0	4
23	N'dounga 3	Southern-sahelian	10-50	-	9	1	10
24	Kollo	Southern-sahelian	20-80	-	7	4	11
25	Say-2	Southern-sahelian	5-20	-	3	6	9
26	Say-1	Southern-sahelian	5-25	5-15	9	3	12
27	Seberi	Southern-sahelian	10-60	5-15	9	2	11
28	Tara	Northern-sudanian	15- 50	-	4	0	4
29	Gaya	Northern-sudanian	10-40	5-15	3	8	11
30	Diffa	Typical-sahelian	5-20	-	1	1	2
	Total				**155**	**60**	**215**

*non taken

Its incidence was between 5 and 90% (Table 3). The most popular varieties, Bassiroumo and IR1529-683-1 were the most infected ones. Perimeters such as Kirkissoye, Saga, Liboré, Kollo, Sébéri and Yelwani were under strong attack with incidences reaching 60 – 90 %. Others perimeters had infestation levels hardly exceeding 30 % (Table 3). Except N'Dounga1 perimeters, the least attacked perimeters were located in Northern-sahelian zone (dry zone) and the most attacked in sahelian and southern-sahelian areas (more humid). Moreover, the incidence of rice yellow mottle disease was more important in wet season than in dry country side (Table 3). The average yield losses calculated at Sébéri, Kollo, Liboré and Kirkissoye varied between 35 and 71% (Table 4).

The lowest losses of production were recorded in Sébéri where they do not exceed 35% whereas in all the other studied localities, yield losses exceed 45%, and even reached 71% in Kollo.

Table 4: Importance of yields losses in very infected rice sites of Niger

Locality	Incidence (%)	Productions losses (%)	Unregistered losses (%)
Sébéri	60	57.18	34.31
Kollo	80	82.39	65.91
Liboré	90	77.86	70.08
Kirkissoye	70	65.00	45.50

Hosts reservoirs of RYMV in Niger Republic rice ecology: Out of 215 isolates recorded, 60 came from different weeds (Table 5).

Table 5: Structure of RYMV populations in Niger as revealed by propagation on two susceptible and two resistant varieties

Localities	Total isolates	Types				
		Wild type[1]	RB1[2]	RB2[3]	RB3[4]	Particulars[5]
Bonfeba	5	5				
Daiberi	12	7	1	1		3
Daikaina	8	4	3	1		
Diambala	2	2				
Diomana	3	2				1
Karegorou	16	8	8			
Karma	5	5				
Koutoukale	11	7				4
Lata	1	1				
Libore	8	5	2	1		
Lossa	7	4	3			
Namarde	5	4	1			
N'Dounga	5	1		1	3	
N'dounga 1	4		4			
N'dounga 3	10	5	4	1		
Saadia	2	2				
Saga	6	2		1	3	
Say-2	9	3	2		3	1
Say-1	12	7	1		3	1
Seberi	11	3	6	1		1
Tara	4			1	3	
Toula	10	4	1		2	3
Yelwani	5	1	1			3
Gaya	11	10	1			
Kirkisoye	12	9	2		1	
Kollo	11	10			1	
Namari	2	2				
Kokomani	5	3	2			
Sona	8	6	1		1	
Diffa	2		2			
Total	**215**	**125**	**45**	**8**	**20**	**17**
Total RB (%)			**33.9**			

[1]virulent on sensible varieties; [2]virulent on Gigante; [3]virulent on Tog5681; [4]virulent on Gigante/Tog5681; [5]particulars profles

These hosts included 10 species which belong to wild rice *Oryza longistaminata* and to the families of Poacea and Cyperaceous (Table 6). Among Poacea, the species *Laersia hexandra*, *Paspalum emplectens*, *Eulesine indica*, *Echinochloa colona* and *Panicum repens* were purposed as RYMV hosts reservoirs. Among the Cyperaceous family, *Cynodon dactylon*, *Cyperus rotondus*, *Cyperus sp*. and *Kilinga sp*. were species harboring RYMV. *Laersia hexandra* proved to be the most infected weed in Niger rice environment, followed by *Eleusine indica* and *Cytodon dactylon*

Table 6: Species of RYMV hosts reservoirs identified in Niger rice ecology

S/N	Species	Family	Number of site	Number of isolate
1	*Echinocloacolona*	*Poacea*	3	3
2	*Leersiahexandra*	*Poacea*	12	25
3	*Cyperusrotondus*	*Cyperacea*	3	3
4	*Cynodondactylon*	*Cyperacea*	6	7
5	*Paspalumemplectens*	*Poacea*	4	6
6	*Panicum repens*	*Poacea*	1	1
7	*Oryzalongistaminata*	*Poacea*	3	4
8	*Kylingasquamulata*	*Cyperacea*	1	1
9	*Cyperussp.*	*Cyperacea*	2	2
10	*Eleusine indica*	*Poacea*	7	8
		Total		**60**

Pathogenicity of Niger-RYMV isolates: More than 500 samples of rice and *Graminaceous adventitious* leaves were collected in the Niger rice plantations, between years 2005 and 2008 (Table 2). Serological and pathological tests carried out on these samples made it possible to attest presence of the virus responsible on the entire sites. Two hundred and fifteen (215) RYMV isolates were obtained. The biological profiles of these isolates indicated 3 main types in Niger rice ecology (Table 5):

1. The wild isolates (S) caused symptoms on the two susceptible varieties but not on the two resistant ones (Gigante and Tog 5681);
2. The resistance breaking isolates (RB) attacked one or the other of the two resistant varieties (RB1 and RB2 isolates respectively) or both the two (RB3 isolates);
3. The isolates with particular pathogenic behavior included:

- isolates positive in ELISA test but not producing any symptoms the susceptible varieties;
- isolates negative in ELISA test but infecting one of the susceptible varieties and
- isolates pathogenic on one of the susceptible variety but not on the other.

The results of the propagation of RYMV isolates on four varieties (Table 5) indicated an occurrence of about one third of isolates overcoming the high resistance of Tog5681 and / or Gigante. There was no RB isolate in Bonféba and Gaya rice perimeters; whereas all the isolates collected at Diffa, N'Dounga 1 and Tara were resistant breaking. More than half of the isolates of Diomana, Saga, Say 2 and Sébéri perimeters were resistance breaking (RB).

Serotyping of Niger RYMV isolates RYMV: Serological profiles of RYMV isolates tested with polyclonal antibodies classified them in two main groups Sg1 and Sg2. The Sg1 was subdivided in 3 sub-groups (Sg1a, Sg1b and Sg1c) whereas the Sg2 contained 2 sub-groups, Sg2a and Sg2b (Table 7). This suggested a serological diversity in Niger rice ecology. The serogroup Sg1 was more frequent that the Sg2 one. Among the serogroup Sg1, the sub-group Sg1b seemed to be the most cultivated. The 2 serogroups were distributed in all rice area of Niger republic. However, in some perimeters only one serogroup was found. For example, only the serogroup Sg1 was found in the sites of N'Dounga and Liboré whereas only Sg2 one was detected at Namardé.

Table 7: Serogroups (Sg) repartition in Niger rice ecology

Site	SerogroupSg 1			SerogroupSg 2		Total
	Sg1a	Sg1b	Sg1c	Sg2a	Sg2b	
Bonfeba (BON)			1			1
Daiberi (DAB)		2	1		2	5
Daikaina (DAK)	2	1	1		2	6
Diambala (DIA)		1				1
Diomana (DIO)		1				1
Karegorou (CAR)	3			1	1	5
Karma (KAR)			1		1	2
Koutoukale (KOU)		1		1	1	3
Lata (LAT)		1				1
Libore (LIB)		1	1			2
Namarde (NAM)				2		2
Lossa (LOS)		1				1
N'Dounga (NDO)	2		1			3
N'dounga 1 (NDO1)		1		1	1	3
N'dounga 3 (NDO3)		1			1	2
Saadia (SAD)	1		1		1	3
Saga (SAG)	2		2		1	5
Say-1 (SAY1)		2	1	2	1	6
Seberi (SEB)		1		2	1	4
Tara (TAR)	1		1		1	3
Toula (TOU)		3		1		4
Yelwani (YEL)		1	1	1		3
Total	**11**	**18**	**12**	**11**	**14**	**66**

DISCUSSIONS

The current results confirmed the narrowness of the genetic basis of the cultivated material (Sy and Séré, 2001) making the rice culture vulnerable to the disease, as soon as favorable conditions to disease propagation are met. This includes the presence of virus reservoirs and the multiplication of insect vectors because the first infections are initiated from infected wild rice, graminaceous and volunteer rice present in the surrounding area. Thereafter the disease is spread to the nearby cultivated rice by insects-vectors and / or during cultural practices. This pattern of RYMV propagation was reported in various rice ecologies of West Africa, in particular, in Mali and Burkina Faso (Sarra *et al.* 2004; Traore *et al,* 2006 a; Traore *et al.,* 2009). Among the wild species identified in this study, only *Eleusine indica* had already been described as alternate host of RYMV in Niger rice environment (Konaté *et al.* 1997). The other species were reported here for the first time. However, they were reported in other countries of West Africa where RYMV is endemic (Abo *et al.* 2000; N'Guessan *et al.* 2001; Sarra *et al.* 2004). The presence of these weeds in irrigated zones constitutes potential sources of the inoculum (Kouassi *et al*. 2005). Studies showed the role played by alternate hosts (*Graminaceous adventitious*) and wild rice in inter growing cycles (Allarangaye *et al.* 2006). Indeed, RYMV survived in the wild plants when rice is not cultivated. Moreover, such viral pressure favored the emergence of resistance breaking isolates of RYMV (Sorho *et al.* 2005). Thus, an integrated control of RYMV disease should be based on a strong reduction of infectious reservoirs.

The current work indicated that the disease colonized all Niger irrigated rice perimeters. Yield losses due to rice yellow mottle disease were quite important for rice production in Niger Republic. An earlier study of Rechkaus and Adamou in 1986 indicated the presence of RYMV in a few country rice perimeters only with losses from 58 to 68 % reported (Kouassi *et al.* 2005).

Dry conditions appeared less favorable to the infection as compared to wet condition. Since 1991, Thresh and collaborators reported that the frequency of viral epidemics was related to vector pressure (Nwilene, 1999). The importance of the disease in wet season could be explained by vectors outbreak at this period, due to more favorable climatic and food conditions. The presence of many vectors would then increase the spread of RYMV to a large number of rice fields. By contrast, in the dry country side, the low number of insects due to poor habitat conditions decreases considerably virus propagation in the fields. WITA 8 is a variety created by AfricaRice in Nigeria and known to be tolerant to RYMV disease (Unpublished). It was introduced in Niger after the epidemic burst of the early nineties (Sido, 1999). However, rice perimeters of Kirkissoye, Saga, Liboré, Kollo, Sébéri and Yelwani grown with WITA 8 were strongly infected.

The resistance breaking isolates appeared more and more in African rice ecologies. Their emergence under natural conditions in various rice environments of Africa (Traore *et al.* 2006 b; Rakotomalala *et al.* 2008; Amancho *et al.* 2009) and from successive inoculations of wild isolate to resistant varieties (Fargette *et al.* 2002, Sorho *et al.* 2005) constituted a new challenge for genetic control of the rice yellow mottle disease.

The pathogenicity of ELISA negative isolates might indicate that, in these samples, virus quantity did not reach a threshold serologically detectable but remains infectious. Such a response was reported on Graminaceous adventitious by Sorho *et al.* (2005). The reaction of ELISA positive but non-pathogenic isolates suggest that they are not sufficiently aggressive on the varieties tested. Similar results were reported by N'Guessan *et al.* (2001).

Last, pathogenicity of some isolates only on one or other of the susceptible varieties could indicate a difference in response between Bouake 189 and IR64 which should be elucidated. Indeed, one can reasonably draw aside a possibility of escape during the inoculation because all the leaves were inoculated by the same viral solution. The presence of two serogroups Sg1 and Sg2 have already been reported in the Sahel by Sere *et al*. 2005 and 2007. Moreover, molecular analysis and serological studies using monoclonal antibodies conducted in African isolates described six major strains: (i) S1, S2 and S3 located in West Africa (N'Guessan *et al*. 2000), (ii) typical S1-AC of Central Africa (Traore *et al*. 2001; Traore *et al*. 2005); (iii) S4, S5 and S6 specifics to East Africa (Fargette *et al*. 2004; Traore *et al.* 2005)

It would be interesting to investigate the distribution of RYMV serotypes in Niger republic using such methods in order to know at which group Niger strains are related. A preliminary study on some RYMV samples reported that Niger-RYMV belonged to the strain S1-AC (Traore *et al.* 2005). Molecular analysis on RYMV isolates collected in practically all perimeters and on various hosts would make it possible to better characterize Niger RYMV strains.

CONCLUSION AND PROSPECTS

Rice yellow mottle disease was found in all Niger irrigated rice perimeters. Its incidence varied between 5 and 90%, depending on the sites. Yield loss various according the perimeters and up to 71 % was reported. The disease is more severe in wet season than in dry season and, in general, the southern-sahelian zones, less dry than the sahelian ones, were more affected. The narrow genetic basis of widely grown varieties and their susceptibility to the disease as well as the presence of a strong proportion of resistance breaking isolates constituted a serious threat to rice growing intensification in Niger republic. The species *Leersia hexandra*, *Paspalum emplectens*, *Echinochloa colona*, *Panicum repen*s, *Cynodon dactylon*, *Cyperus rotondus*, *Cyperus sp.* and *Kylinga sp* were purposed as hosts reservoirs of RYMV in this environment. The pathological properties of the isolates and particularly the resistance breaking ones need further investigation by studying the interaction between a large range of Niger RYMV isolates and rice varieties.

ACKNOWLEDGEMENTS

The International Foundation of Science (IFS) and the government of Japan had supported financially the researches. We thank them for their contributions. We thank also M. George SOTON (support staff at AfricaRice) and M. Bizo MAHAMADOU (support staff at INRAN-Niger) for their technical assistance

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