BIBLIOGRAPHY

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ABSTRACT

This study was conducted to assess the incidence and severity of Rice Tungro Virus in Sta. Cruz, Zambales.

Results in the field assessment revealed that infection occurred only in Tubo-tubo South and Sabang.

Reported weeds alternate hosts, surveyed in six barangays of Sta. Cruz, Zambales and found widespread in all assessed fields, furthermore, rice stubbles and volunteer rice as a source of inoculums and alternate hosts of RTV was observed on infected fields.

In the interviews conducted, farmers observed yellowing and stunting of rice once or twice a year especially during the rainy season when vector insects are observed.

RESULTS AND DISCUSSION

Rice TungroVirus Symptoms Observed in Survey Areas

Several symptoms suspected to be caused by RTV were manifested by rice varieties Rc 14 and Rc 18. These include yellow green to yellow color of leaves (Figure 1 and 2), stunting (Figure 3) and stunting in combination with color change of leaves from green to yellow-orange, mottling, with dark brown spot (Figure 4).

Figure 1. Rice variety Rc 14 at vegetative stage as observed in Tubo-tubo South

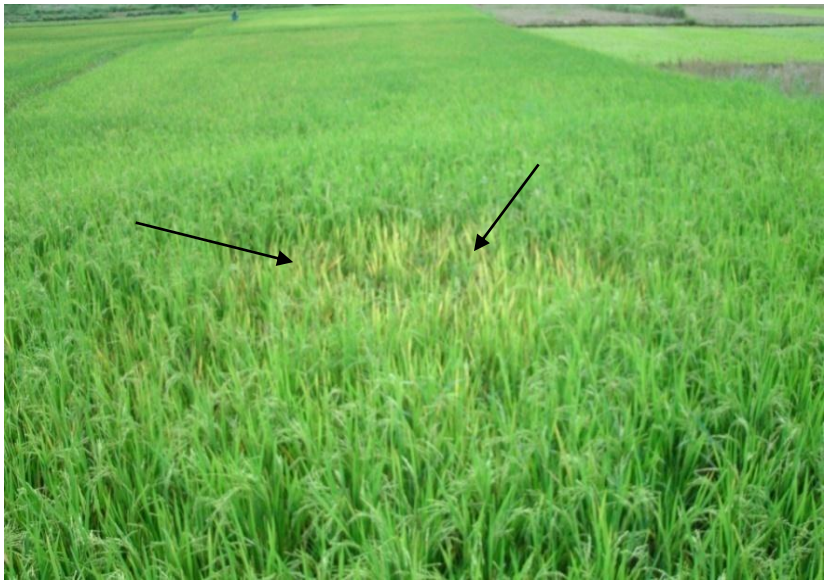

Figure2. Rice variety Rc 14 showing yellow to yellow green discoloration at reproductive stage

Figure 3. Rice variety Rc 18 showing stunting at reproductive stage

Figure 4. Rice variety Rc 18 showing yellow and stunting during reproductive stage

Rice TungroVirus Severity and
Incidence in Survey Areas

From the interviews conducted, farmers perceived the disease symptoms as feeding damage by insects which they manage by chemical spraying as immediate remedy. Though only two fields showed infection of RTV (Tubo-tubo South and Sabang), other farmers say that they also observed yellowing and stunting of rice at least once or twice a year especially during the rainy season when insects are observed, on the other hand the characteristics that was planted during the assessment reported to be not resistant to tungro virus.

Furthermore unlike other sites, affected fields and its surroundings are abundant with rice stubbles and volunteer rice, where in Mukhopadhyay *et al*., 1986 report that it could act as source of inoculums for the carryover of tungro especially under intensified rice cropping systems with continuous planting like in Sta. Cruz, Zambales. The assessment also recorded the ways of rice planting done by farmers where transplanting is common whereseed is sown in one place and the seedlings after they have grown a little are transplanted to another, this is done in order to get higher yields and less weeding. Chancellor *et al.*, 1996 reported that early immigration of leafhoppers into rice plots was greatest in wet seasons (WS) and was also high in a late-planted dry season (DS) crop which was out of synchrony with surrounding rice fields and the size population is not directly related to the incidence of RTV unless inoculums pressure is taken into account then secondary spread of the infection will occur.

Although no green leaf hopper was collected in the field due to the age of the rice during the survey and collection of insect vector it does not mean that the vector is absent

Table 2. Severity and incidence of Rice Tungro Virus in the field

SURVEYED BARANGAY	FARMER	AREA (m^2)	GROWTH STAGE	RICE VAR.	RTV SEVERITY	RTV INCIDENCE
Tubo-tubo South	B. Mehos	8,000	reproductive	Rc 14	11.28% =5 severity	36%
			vegetative	Rc 14		
Sabang	R. Torneto	20,000	reproductive	Rc 18	11.42% =5 severity	49%
	L. Morilo	6,000	reproductive	Rc 14		
Biay	M. Morilo	10,500	reproductive	Rc 28	none	none
	O. Bernal	3,000	reproductive	Triple 2	none	none
Naulo	R. Mendi	4,000	reproductive	Rc 14	none	none
Bayto	L. Morilo	4,500	reproductive	Rc 14	none	none
	J. Moralde	22,000	reproductive	Rc 28	none	none
	R. Renante	13,000	reproductive	Triple 2	none	none
Lucapon North	S. Bibal	15,000	reproductive	Rc 152	none	none

on the vegetative stage of the rice. Chancellor and Holt, 2008 reported that GLH vectors prefer to feed on young rice plants and tend to migrate from old to younger and more susceptible plants. From the observation and data recorded the possible caused of infections within a field are; transplanted seedlings infected with viruses prior to transplanting by GLH that acquired virus from infected stubbles and volunteer rice which is abundant on the field where the infection observed and new growth from infected stubbles that had not been properly plowed under and harrowed effectively.

Rice TungroVirus Weeds as Alternate Hosts in Survey Areas

The different types of grasses which are alternate host for RTV that is find along irrigation canals and widely spread on the rice fields assessed (Table 3).

From the observation, *Echinochloa* sp. is prevalent in the rice field which is present in all barangays except in Naulo followed by *Fimbristylis miliacea* (L.) recorded in three barangay and *Eleusine indica* in two barangay and lastly *Leersia hexandra* Sw. which recorded in only one barangay, on the other hand *Leersia hexandra* Sw. is prevalent in irrigation canals which is observed in all barangays except Tubo-tubo South and *Eleusine indica* which is only observed in Naulo. In spite of the presence of weed alternate hosts of tungro virus on the assessed area, other fields did not show infection of RTV. Tiongco *et al.,* 1993, reported that there was negative transmission of RTV from infected rice to the reported weed alternate hosts. The result is not consistent with the earlier investigation which reported positive detection of the virus on some weeds including *Leersia hexandra* (Anjaneyulu *et al*., 1988; Parejarearn *et al*., 1990; Khan *et al*., 1991).

Aside as weeds, rice stubbles were also present. These rice stubbles can act as reservoir for tungro viruses and the importance of volunteer rice as a source of tungro virus and as a temporary refuge and source of food for the vectors in harvested fields.

Table 3. RTV weed alternate hosts found on the fields and along irrigation canals

WEED ALTERNATE HOST	PRESENCE IN RICE FIELD	PRESENCE IN IRRIGATION CANALS
• Tubo-tubo South	*Fimbristylis miliacea* (L.) *Echinochloa* sp.	
• Sabang	*Leersia hexandra* Sw. *Fimbristylis miliacea* (L.) *Echinochloa* sp. *Eleusine indica*	*Leersia hexandra* Sw.
• Biay	*Echinochloa* sp.	*Leersia hexandra* Sw.
• Naulo		*Eleusine indica* *Leersia hexandra* Sw.
• Bayto	*Echinochloa* sp. *Eleusine indica*	*Leersia hexandra* Sw.
• Lucapon North	*Echinochloa* sp. *Fimbristylis miliacea* (L.)	*Leersia hexandra* Sw.

Figure 5. Weed alternate host *Eleusine indica* along irrigation canals

Figure 6. Weed alternate host *Leersia hexandra* Sw. in the field with rice plant showing yellowing

Figure 7. Weed alternate host *Fimbristylis miliacea* (L.) in the field

Figure 8. Weed alternate host *Echinochloa* sp. On field with rice plant at vegetative stage

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study was conducted to assess the incidence and severity of RTV in Bayto, Tubo-tubo South, Biay, Naulo, Sabang, and Lucapon North Sta. Cruz, Zambales based on symptomatology.

Among the six barangays the presence of RTV was recorded in Sabang and Tubo-tubo South Sta. Cruz Zambales. In spite of the absence of the insect vector, weeds which are reported to be alternate hosts, rice stubbles and volunteer rice were present infields infected with tungro virus.

Conclusion

The incidence and severity of RTV in Sta. Cruz, Zambales in the field during summer are generally low. Nevertheless the data should not be overlooked noting that two rice field, Tubo-tubo South and Sabang, showed symptoms, and that the four weed alternate hosts, rice stubbles and volunteer rice were widespread in fields. Once the insect vector *Nephotettix virescens* is available, the RTV can be transmitted from infected plants to the healthy rice plants. It happened that the insect vector was not present during the summer period and the early immigration is greatest during rainy season.

Recommendations

Further study should be done in the same field during rainy season when the vector is present. In addition, a greenhouse study should be done to verify the efficiency of the different weeds as alternate hosts, rice stubbles and volunteer rice to healthy plants.

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