Plant Archives Vol. 26, Supplement 2, 2026 pp. 117-124 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-2.012

EPIDEMIOLOGICAL SURVEY AND DOCUMENTATION OF RICE TUNGRO VIRUS ACROSS INDIAN ENDEMIC ZONES

A. Vedasree[1*], M. Prameela[1], D. Krishnaveni[2], Satendra Kumar Mangutharia[3], and D. Saida Naik[4]

[1]Department of Plant Pathology, College of Agriculture, PJTAU, Rajendranagar, Hyderabad, India
[2]Department of Plant Pathology, Indian Institute of Rice Research, Rajendranagar, Hyderabad, India
[3]Department of Biotechnology, Indian Institute of Rice Research, Rajendranagar, Hyderabad, India
[4]Department of Crop physiology, College of Agriculture, PJTAU, Rajendranagar, Hyderabad, India
*Corresponding author E-mail: vedhasreeadam97@gmail.com
(Date of Receiving : 09-03-2026; Date of Revision : 22-04-2026; Date of Acceptance : 17-05-2026)

ABSTRACT

Rice tungro virus disease is one of the major viral diseases which highly affects the production and productivity of crop. But in recent years the occurrence of rice tungro virus disease has been drastically reduced due to changes in climatic conditions, diversity of rice varieties, vector population and different management practices taken for controlling the diseases and insect vector population. In this study a survey has been conducted in different regions of India for disease occurrence. In this survey the highest disease incidence of 90 – 92 per cent has been recorded in the fields of Ramjibanpur and Beninagar villages of Katwa block in Purba Bardhhaman region of West Bengal. Along with the disease incidence, a high number of green leaf hoppers viz., 10-15 insects / sweep population, which acts as vector for the disease has been recorded. The sudden surge in vector population occurred due to indiscriminate usage of chemicals for controlling pests like Brown plant hopper and stem borer has led to higher incidence of disease in these regions. The other surveyed regions do not record any disease occurrence and insect vector population in these regions was lower i.e. 1-2 glh/sweep compared to the highly infected areas. During survey it is observed that the rice variety Swarna has been severely infected by the disease. The factors like vector population, susceptible host and favourable weather conditions helped in spread of the disease. This study helps us in understanding the status of RTV and the role of vector, variety of crop and weather parameters in sudden outbreak of disease in the fields helps in assessing the risk of outbreak of RTV in India.

***Keywords*:** Rice tungro virus, green leaf hopper, disease incidence, Swarna and West Bengal.

Introduction

Rice (*Oryza sativa*) is major staple crop grown in different parts of the world. In India, Rice is second largely grown cereal crop followed by wheat (Ricepedia, 2019). Rice is highly preferred for consumption due its nature of digestibility and taste (Headey, 2003). The rice crop is being affected by different biotic and abiotic stresses. Among the biotic stress, the diseases caused by fungi, bacteria and virus has caused severe losses in production. Among the viral diseases which affects rice crop, rice tungro virus disease is the major disease which causes losses up to 80 per cent (Rao and Anjaneyulu, 1980). Rice tungro disease is caused by two viruses i.e. Rice Tungro Bacilliform Virus and Rice Tungro Spherical Virus of family *Pararetrovirus and Sequiviridae.* (Singh *et al*., 1984). The tungro virus complex is transmitted by the green leafhopper (GLH, *Nephotettix virescens*) and other leafhopper species *viz., N. nigropictus* Stal*, N. parvus* Ishihara*, N. sympatricus* Ghauri*, Recilia dorsalis etc.,* in a semi-persistent manner. Rice Tungro Spherical Virus is transmitted independently while RTBV requires RTSV or RTSV- related helper factor for transmission by GLH. Hence, RTBV is transmitted only when virus source is infected with RTBV and RTSV or when GLH acquires first RTSV then RTBV. Green leafhoppers that fed on plants infected with RTBV and RTSV generally transmit RTBV and RTSV together or RTBV alone and occasionally RTSV alone

(Dahal and Hibino, 1988). The occurrence of disease is directly related to the transmission ability of the vector. In recent years the occurrence of rice tungro diseases has been reduced drastically. It is important to pay greater attention to studies on RTD epidemiology, in particular its sporadic occurrence, distribution, and effect of changing climate in its infestation is of great importance. Changes in agricultural landscapes, cropping patterns, and irrigation practices have also influenced the epidemiology of Tungro virus disease. Intensive rice cultivation, monocropping, and continuous flooding of fields create favourable conditions for the proliferation of both the vector and the virus which is leading to increased disease incidence. The genetic diversity among rice cultivars also plays a significant role in disease epidemiology (Asma *et al*., 2023). It is important to study about tungro virus disease dynamics and improve strategies for disease management and increase rice production in India. Hence the present study is conducted to know about the current status of disease incidence, favourable conditions and factors which effect the disease epidemiology through the survey conducted in different regions of India.

Materials and Methods

The roving survey has been conducted during the *Kharif* season of year 2025 regarding the occurrence and prevalence of rice tungro virus disease in different regions of India. In state of Telangana, roving survey has been conducted in Ranga Reddy and Nalgonda districts. In state of Tamil Nadu survey has done in Coimbatore and Tiruvallur districts which were known to be endemic areas. Survey has been done in others places like Chinsurah, Ramjibanpur and Beninagar in West Bengal. The fields of rice were visited and were observed for the presence of disease. In each field Five plots of size 10 x 10 m^2 were observed for presence of viral disease. Total number of plants observed in a plot and number of infected plants were observed and noted. The percent disease incidence has been calculated based on the formulae given by Wheeler, 1969.

$$\text{Per cent disease incidence (PDI)} = \frac{\text{Number of diseased plants}}{\text{Total number of plants examined}} \text{ X } 100$$

Based on the collected data, Per cent Disease Incidence has been calculated. Along with the disease incidence, the vector population has been recorded based upon the net sweepings. The data like variety sown in the field, types of soil, weeds observed in fields during were also recorded. The weather parameters data like amount of rainfall, Maximum temperature, minimum temperature and relative humidity were recorded from the regions where the disease has been observed. The Month wise weather data of Chinsurah region of West Bengal has been collected. The relation between Host, Virus and vector population enables to study about the occurrence and spread of the disease.

Results and Discussion

Survey

The survey has been conducted during the *Kharif* season of 2025 regarding the occurrence and prevalence of rice tungro virus disease in the states of Telangana, Andhra Pradesh, Tamil Nadu, and West Bengal. In Telangana state, roving survey has been conducted in Ranga Reddy, Nalgonda and Suryapet districts. In district of Ranga Reddy survey was done in Rajendranagar mandal. In the district of Nalgonda, survey has been conducted in the villages Nalgonda and Chityala. In Suryapet district survey has been conducted in villages Mukundapuram, Tipparthy, Gopalapoora and Kampa Sagar of Suryapet mandal (Fig. 1). During the survey no occurrence of the rice tungro disease has been observed in Telangana state. The medium number of vector green leaf hopper (*Nephotettix virescens*) i.e. 0-1 glh/sweep populations has been recorded in the fields. In Andhra Pradesh, survey has been conducted in surroundings of Guntur and Bapatla districts (Fig. 2). No disease incidence has been recorded in this state, but a low GLH population i.e. 0-1 glh/sweep has been recorded. In state of Tamil Nadu survey has been conducted in fields near by Paddy Breeding station of Tamil Nadu Agriculture University of Coimbatore district and Rice Research Station of Tirur in Tiruvallur Districts (Fig. 3). The fields observed did not have incidence of rice tungro virus disease. A low amount of GLH population has been observed.

Disease Incidence

In West Bengal, survey has been conducted in fields near Rice Research station, Chinsurah of Hooghly region and two villages Ramjibanpur and Beninagar villages of Katwa block in Purba Bardhhaman region of West Bengal (Fig .4). In this survey the highest disease occurrence ranging 90 to 92 per cent has been recorded in the fields of Ramjibanpur and Beninagar villages of Katwa block in Purba Bardhhaman region of West Bengal (Fig. 5). In 1967 Raychaudhuri *et al*. first reported from India that a new disorder designated as leaf yellowing is transmitted by *N. virescens*. Later V.T John in 1968 confirmed it as tungro which occurred as epidemic in the states of West Bengal, Bihar, and Uttar Pradesh where the varieties Jaya and Padma are susceptible to tungro. Later the epidemic occurred in northeastern region in

1973 and in Kerala during 1974. The severe incidence of disease was reported during *kharif* in parts of Bihar and West Bengal in 1981. The disease incidence has reported from 40 to 100 per cent in Bihar and about 60 to 100 per cent in West Bengal (Singh *et al.*,1982). Banerjee *et al.* (2009) has conducted exhaustive surveys to identify the locations of tungro incidence in West Bengal during 2007-2008 and samples showing tungro like symptoms were collected and checked for the presence of tungro through polymerase chain reaction (PCR) using primers specific for the tungro viruses. Krishnaveni *et al*. (2011) conducted a survey in Telangana region and noticed outbreak of rice tungro disease during *Kharif* 2007 in northern Telangana, India. Over 19,000 acres in Karimnagar and Medak districts were severely affected by the disease.

Vector Population

Along with the disease, a high number of green leaf hoppers i.e. 10-15 insects/ sweep population which acts as vector for the disease has been recorded. The sudden surge in GLH population may be attributed due to indiscriminate usage of chemicals for controlling pests like Brown plant hopper and stem borer which eventually led to higher incidence of disease in these regions. Krishnaveni *et al*. (2011) studied about the species composition of vectors present in the tungro damaged area consisted of green leafhopper species *N. virescens* and *N. nigropictus* and zig-zag leafhopper species *Recilia dorsalis* in that order of abundance. Rao and Hassanuddin (1991), has studied about the virus vector relationship, where they observed the increase in rice tungro disease incidence is directly proportional to the population of green leaf hopper. Azgar and Yonzone 2020, has studied about the population of green leafhopper (GLH) was recorded in different varieties like IET4786, IET1444, MTU7029 (Swarna) and IR36 at different crop stages namely seedbed, maximum tillering stage, flowering stage and panicle formation stage. The highest vector population has been recorded during the maximum tillering stage of crop.

Variety Sown

The rice variety Swarna has been grown in vast regions of these villages and the disease has been observed severely in this variety. This variety have broader leaves which were highly opted by insects for feeding and susceptible for tungro virus. The higher number of GLH vectors were been noticed on this variety as insects highly feeds on this variety. Anjaneyulu *et al.* (1982) conducted a study on the possibilities of rice cultivars and their stubbles acting as sources of reservoir hosts for tungro virus. Due to intensive cultivation of high yielding cultivars, it has been a common practice especially in states i.e. West Bengal and Tamil Nadu, to overlap two crops of rice cultivars. Under such circumstances, tungro virus might survive and propagate in the principal host itself.

Weather Parameters

The weather parameters like rain fall, Maximum temperature, minimum temperature and Relative humidity play a major role increase in vector population and disease incidence. The weather parameters of Chinsurah region of west Bengal were collected (Table.2.). The highest amount of rainfall has been observed in month of July followed by August and September of 322.3, 307.5 and 281.2 mm. This amount of rainfall has helped in increasing the vector population and resulted in spread of disease. The maximum temperature and minimum temperature have been recorded higher in month of June and it has been gradually reduced till November. The decrease in day temperature has enabled the faster replication of vector population and transmission of disease. The relative humidity of Chinsurah is above 90.0 in all the months, which helps in development of disease. All these weather parameters have directly and indirectly favored in development and spread of disease in villages like Ramjibanpur and Beninagar of Katwa Subdivision in West Bengal. The similar study has been conducted by Rashid *et al*., 2024 as they studied about the relationship between susceptible rice varieties, presence of abundant GLH in the seedbed as well as viruses with disease symptom in Bangladesh. The monthly average maximum (>25^{o}C)) and minimum temperature (<17^{o}C) during July to September, and average per cent relative humidity (70 %) at evening are found the most critical determinants for tungro disease devastation in Cumilla region of Bangladesh. The rainfall during January to March and July to September was found very weak relation with GLH population. It is also confirmed that the severe tungro disease infections in the main field come from the virus-infected seedlings of the seedbed for tungro-prone areas in Bangladesh.

Conclusion

In recent years, the incidence of rice tungro disease has been drastically reduced. In order to know about the occurrence and severity of rice tungro virus diseases in different regions of India a survey has been conducted during *kharif* 2025.. It is important to know about the factors effecting the disease occurrence. The correlation of vector population and weather parameters and disease incidence enables us to predict

the disease occurrence. This study emphasis about the relationship between vector population, variety sown in different regions, favorable weather conditions and disease incidence and disease spread in different regions of India. This study helps taking preventive measures in management of the disease.

Table 1 : Survey locations during has been conducted during *kharif* 2025

S. No	State	District	Location (Mandal &Village)	GPS Coordi-nates	Variety Sown	Type of Soil	Vectors	Vector Population	Weeds	PDI (%)	DSI
1	Telangana	Hyderabad	**Rajendranagar**								
			ICAR-IIRR	17.32 78.39	TN1	Black soil	GLH	Low	*Cynodon dactylon Cyprus esculentus Echinochloa crusgualli Chloris barbata Digitaria sanguinalis Euphorbia hirta*	-	-
		Nalgonda	**Nalgonda**								
			Nalgonda	17.16 79.49	BPT5204	Sandy soil	-	-	-	-	-
			Chityala	17.23 79.12	BPT5204	Black soil	GLH	Low			
		Suryapet	**Suryapet**								
			Mukundapuram	17.27 79.11	BPT5204	Black soil	-	-	-	-	-
			Tipparthy	17.23 79.13	BPT5204	Black soil	-	-	-	-	-
			Gopalapoor	16.84 79.45	RNR15048	Black soil	-	-	-	-	-
			Kampasagar	17.01 79.40	KNM118	Black soil	GLH	Low	-	-	-
2	Tamil Nadu	Coimbatore	Coimbatore	11.00 76.92	CO52	Black soil	GLH	Low	*Cyprus esculentus Cynodon dactylon Paspalum distichum*		
		Tiruvallur	Tirur	13.12 79.96	TKM6	Black soil	-	-	-	-	-
3	Andhra Pradesh	Guntur	Guntur	16.29 80.46	BPT5204	Black soil	-	-	-	-	-
		Bapatla	Bapatla	15.99 80.63	BPT5204	Black soil	-	-	-	-	-
			Ramjibanpur	23.72 88.02	Swarna	Black soil	GLH	High	*Echinochloa crusgualli Echinochloa crusgualli Cyprus esculentus*	90	High
			Nirol								
			Beninagar	23.73 88.01	Swarna	Black soil	GLH	High	*Echinochloa crusgualli Cyprus esculentus*	92	High
		Hooghly	**Chinsurah**								
			Chinsurah, RRS	22.90 88.37	Swarna	Black soil	GLH	Low	*Echinochloa crusgualli*	-	-

GLH- Green leaf hopper, RD- *Recelia dorsalis*, Vector population: low – 0-1 GLH / sweep, Medium - 2-3 GLH/sweep, High- >5 GLH/sweep, PDI- Percent Disease Incidence, DSI- Disease Severity Index.

Table 2 : Month wise weather parameters of Chinsurah of year 2025

Chinsurah	Jun	July	Aug	Sept	Oct	Nov
Rainy days (No.)	18	26	22	15	11	1
Rainfall (mm)	185.5	322.3	307.5	281.2	117.1	0.1
Temp. (ºC) Maximum	34.7	32.3	32.6	33.9	31.7	28.8
Temp. (ºC) Minimum	26.4	25	25.4	25.7	23.8	15.8
RH	98.4	96.4	92.2	95.0	93.5	90.0

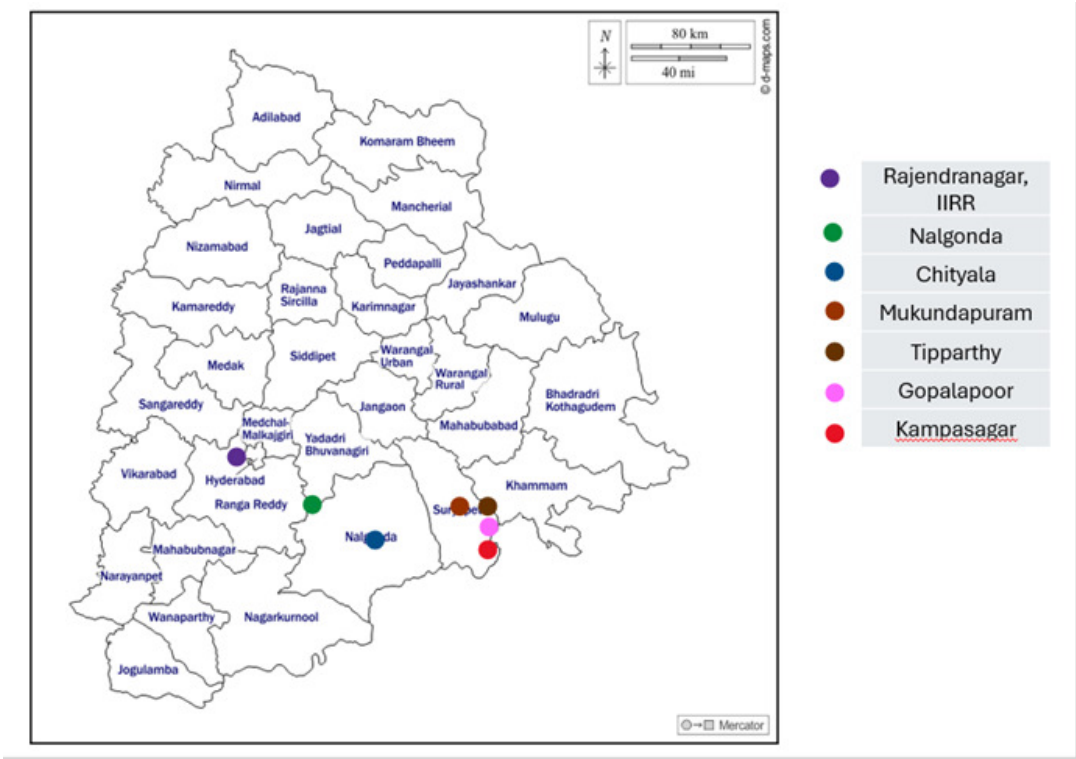

Fig. 1 : Telangana State Map indicating the survey conducted places.

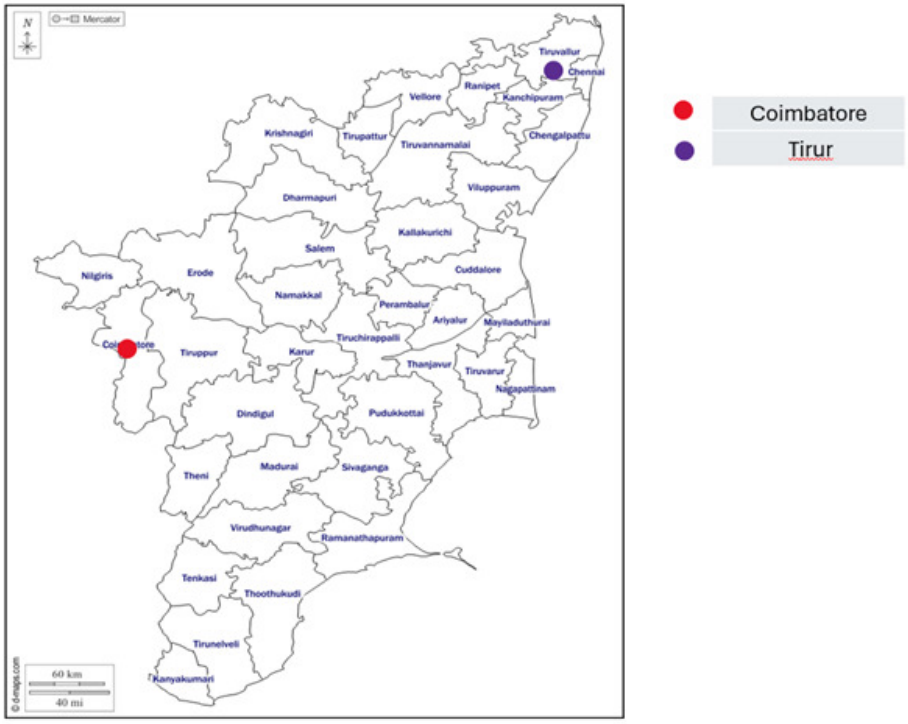

Fig. 2 : Tamil Nadu state map representing the places where survey is conducted.

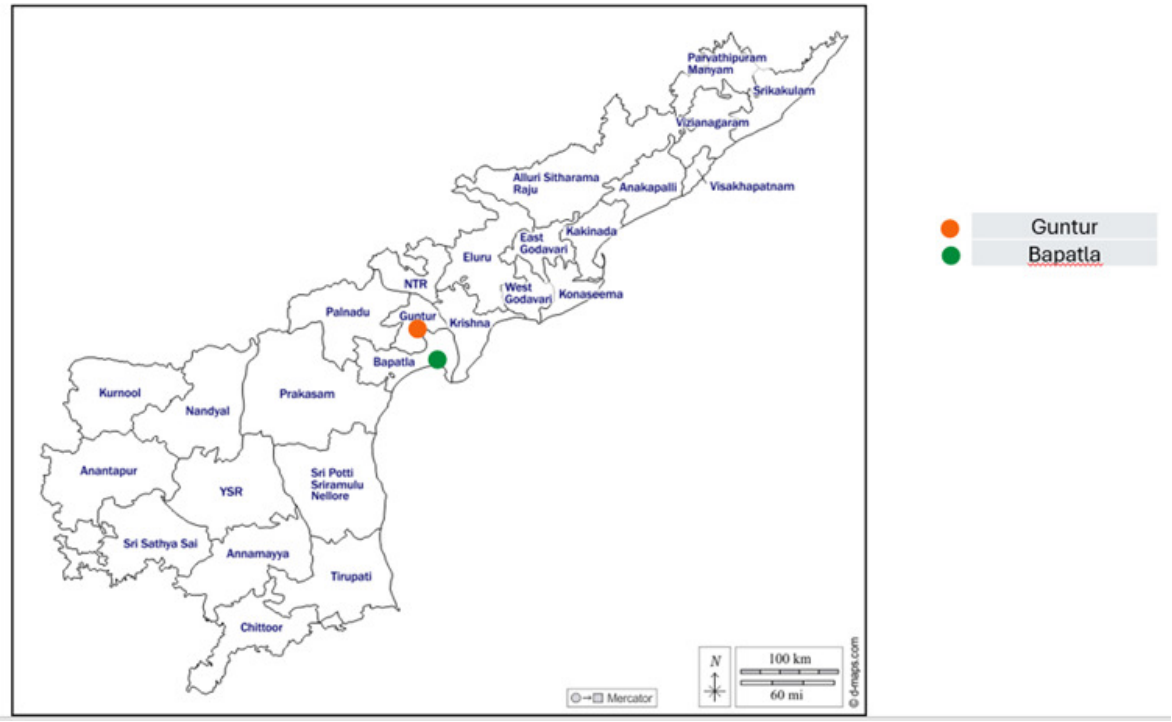

Fig. 3 : Survey conducted places in Andhra Pradesh State

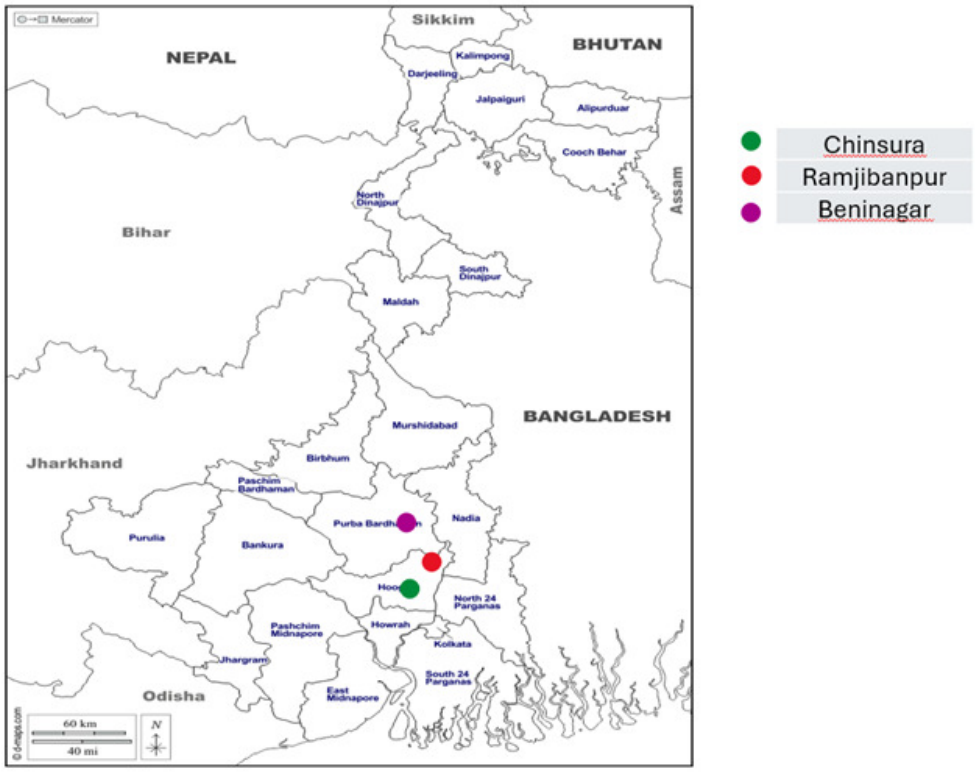

Fig. 4 : Survey conducted regions of West Bengal in *Kharif* 2025.

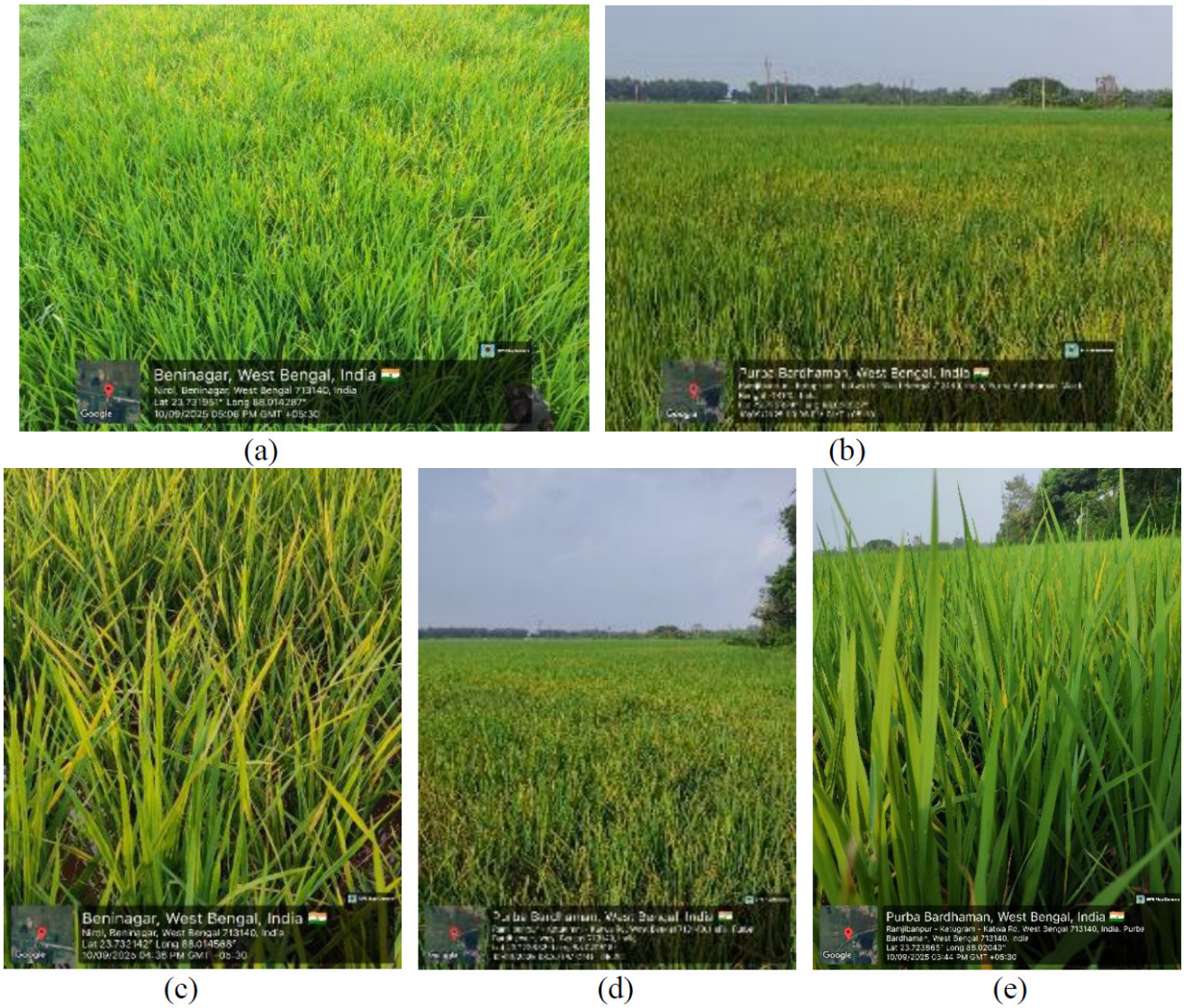

Fig. 5 : (a to d) Images of Rice fields infected with rice tungro virus disease recorded during Survey. **(e)** Infected Rice plant with a greater number of green leaf hoppers.

Acknowledgements

Thanks to Department of Plant Pathology, ICAR-Indian Institute of Rice Research, Rajendranagar, Hyderabad for helping in conducted the survey in different regions of India. Our sincere thanks to Dr. Dilip Kumar Patra, Plant Pathologist, Rice Research Station, Chinsurah, West Bengal and Dr. C. Gopalakrishnan, Professor (Plant Pathology), TNAU, Coimbatore, Tamil Nadu for providing the information about disease and helping during the survey. Thanks to Department of Plant Pathology, College of Agriculture, PJTAU, Rajendranagar, Hyderabad for help during the survey.

References

Anjaneyulu, A., Singh, S. K. and Shenoi, M. M. 1982. Evaluation of rice varieties for tungro resistance by field screening technique. *Tropical pest management*, **28**(2), 147 – 155.

Asma, J., Subrahmanyam, D., & Krishnaveni, D. (2023). Tungro virus disease in India: historical insights and contemporary prevalence trends in rice cultivation. *Agriculture Archives*.

Azgar, M. A., & Yonzone, R. (2018). Studies on the incidence of Rice-Tungro Virus (RTV) and population dynamic of its predominant vector. *International Journal of Current Microbiology and Applied Sciences*, **7**(03), 778-786.

Banerjee, A., Roy, S., Tarafdar, J., & Senapati, B. K. (2009). Present status of rice tungro disease in West Bengal: occurrence and characterization of viruses. *Journal of Crop Weed*, **5**, 232-235.

Dahal, G., & Hibino, H. (1988). Tungro (RTV) transmission and mode of green leafhopper (GLH) feeding

Headey, D. D. The impact of the global food crisis on self-assessed food security (The World Bank, 2013).

John, V. T. 1970. Yellowing disease of paddy. *Indian Farming*, **20**, 27 – 30.

Krishnaveni D, Laha GS, Shanker C, Katti G, Muralidharan K (2011) Virus-vector composition analysis in rice tungro virus epidemics in Telangana region of Andhra Pradesh, India. *Journal of Mycology and Plant Pathology* **41**(3), 441–444.

Rao, G. M. and Anjaneyulu, A. 1978. Host range of rice tungro virus. *Plant Disease Reporter*, **62**, 955 – 957.

Rao, G. M. and Anjaneyulu, A. 1980. Estimation of yield losses due to tungro virus infection in rice cultivars. *Oryza*, **17**, 210 – 214.

Rao, P. and A. Hasanuddin,. (1991). Incidence of rice tungro virus disease and its vector in south Sulawesi, Indonesia. *International Journal of Pest Management,* **37**, 256–258.

Rashid, M. M., Mian, M. S., Nihad, S. A. I., Khan, M. A. I., Bhuiyan, M. R., Jahan, Q. S. A., & Islam, M. R. (2024). Critical Determinants of Rice Tungro Disease Devastation and Its Vector Population Dynamics in Bangladesh. *Bangladesh Rice Journal*, **28**(2), 81-97.

Raychaudhury, S. P., Mishra, M. D. And Ghosh, A. (1967). Preliminary note on transmission of virus disease resembling tungro of rice in India and other virus like symptoms. *Plant Disease Reporter*, **51**, 300 – 301.

Ricepedia, "The CGIAR Research Program on Rice, rice as food," The online authority on rice, (2019).

Singh, S.K, Bhaktavatsaiam, G., Lapierre, H. and Anjaneyulu. A. (1984). Associated two types of virus particles in an isolate of rice tungro disease. *International Reviews and Research Newsletter,* **9**(2), 15

Wheeler, B.E.J. (1969). "An Introduction to Plant Diseases". Jhon Wiley and sons Ltd., London, UK. pp:254.