

- Kumar Pawan, Singh, R., and Pandey, S. K. 1996. Population dynamics of rice leaf folder, *Cnaphalocrocis medinalis* Guen, in relation to stage of the crop, weather factors and predatory spiders. *Journal of Entomological Research*. 20(3): 205-210.
- Kumar, V. and Ladha, J. K. 2011. Direct seeding of rice: recent developments and future research needs. *Advances in Agronomy*. 111: 297-413.
- Mallikarjun, Channabasavanna, A. S., Sudheendra, S. and Shrinivas, C. S. 2014. Effect of herbicides on weed control and yield of wet seeded rice (*Oryza sativa* L.). *The Bioscan*. 9(2): 581-583.
- Nair, K. P. V., Mammen, K. V., Pillai, K. B. and Nair, S.S. 1980. Influence of climatic factors on population of the brown plant hopper in Kuttanand. *Agricultural Research Journal, Kerala*. 18(1): 55-60.
- Pathak, H., Tewari, A. N., Sankhyan, S., Dubey, D. S, Mina, U., Virender K. Singh, Jain, N. and Bhatia, A. 2011. Direct-seeded rice: Potential, performance and problems - A review. *Current Advances in Agricultural Sciences*. 3(2): 77-88.
- Sakia, P. and Parameswaran, S. 1999. Assessment of yield losses at different growth stages of rice due to rice leaf folder. *Annual Plant Protection Science*. 7(4):135-138.

J. Agric. Res. Technol., 47 (1) : 072-077 (2022)

<https://doi.org/10.56228/JART.2022.47114>

Relationship of Rice Diseases and Different Cultivars with Weather Parameters at Maval Region

N. V. Kashid¹, O. S. Godbole², A. P. Deshmukh³, V. A. Sthool⁴, and J. D. Jadhav⁵
College of Agriculture, Shivajinagar, Pune - 411005 (India)

Email : deshmukh.amru@gmail.com

(Received : 20.06.2021 Accepted : 18.07.2021)

Abstract

The field experiment, "Studies on effect of different paddy cultivars with various cultivation methods of paddy in relation to weather parameters." was carried out during *khariif*, 2018 at Agricultural Research Station Farm, Vadgaon Maval, Tal. Maval, Dist. Pune. It was laid out in split plot design with three replications. There were sixteen treatment combinations comprising of four varieties *viz.*, VDN-3-51-18 (*Indrayani*), VDN-99-29 (*Phule Samruddhi*), IET-13549 (*Bhogawati*) and RDN-99-1 (*Phule Radha*) and four cultivation methods *viz.*, M₁ : Four Point Agro Technique (Char Sutri Method), M₂ : Drilling at 22.5 cm, M₃ : Saguna Rice Technique (SRT) and M₄ : Modified Direct Seeded Rice Technique (MDSRT). The lower pest population was observed in paddy variety VDN-99-29 (*Phule Samruddhi*) followed VDN-3-51-18 (*Indrayani*) and higher incidence with IET-13549 (*Bhogawati*) and RDN-99-1 (*Phule Radha*). Pest Incidence was more with drilling at 22.5 cm and lower with Modified Direct Seeded Rice Technique (MDSRT). There was positive correlation between maximum temperature, morning relative humidity, BSS, growing degree day and canopy temperature with incidence of leaf folder and brown plant hopper but negative correlation with minimum temperature, evening relative humidity. Therefore, It would be suggested to Farmers to go for adopt VDN-99-29 (*Phule Samruddhi*) variety, sowing with Modified Direct Seeded Rice Technique (MDSRT) for minimum attack of rice pest.

Key words : Paddy, Cultivation Methods, Varieties, Disease, Correlation.

The average productivity of the state is 2.01 t ha⁻¹. Maharashtra ranks 13th place in rice production in country. Large number of paddy

varieties have been released for cultivation by private and government sector to enhance its productivity. Hence, it is essential to compare the productivity of these high yielding varieties under agro-climatic condition of rice growing belt of the state. The weather condition is warm

1. Officer Incharge, Agril. Research Station, Vadgaon Maval Dist. Pune, 2. M.Sc Student, 3. SRF, 4. Head and 5. Principal A.T.S. Solapur.

and humid. This climatic condition is beneficial for the development of various pests. It is a major problem in increasing rice production here. Considering these facts, the present experiment has been carried out to study the major insect pest incidence on rice ecosystem during *kharif* season.

Materials and Methods

The field experiment, “Studies on effect of different paddy cultivars with various cultivation methods of paddy in relation to weather parameters.” was carried out during *kharif*, 2018 at Agricultural Research Station Farm, Vadgaon Maval, Tal. Maval, Dist. Pune. There were sixteen treatment combinations comprising of four varieties *viz.*, VDN-3-51-18 (*Indrayani*), VDN-99-29 (*Phule Samruddhi*), IET-13549 (*Bhogawati*) and RDN-99-1 (*Phule Radha*) and four cultivation methods *viz.*, M₁ : Four Point Agro Technique (Char Sutri Method), M₂ : Drilling at 22.5 cm, M₃ : Saguna Rice Technique (SRT) and M₄ : Modified Direct Seeded Rice Technique (MDSRT). The gross plot size was 3.40 m x 3.40 m. The other details of cultivation methods were as below.

1) Four point agro technique (Char Sutri method) : 1) Use of paddy crop residues containing silicon for recycling (Black grey rice hull ash @ 0.5 to 1.0 Kg per sq.m. to rice seedlings and paddy straw @ 2 tonnes ha⁻¹ at the time of transplanting. 2) Application of Glyricidea as green manure @ 3 tonnes ha⁻¹ at the time of transplanting. 3) Controlled transplanting of improved varieties at the spacing of 15-25 x 15-25 cm. 4) Use of Urea DAP briquettes (175 Kg ha⁻¹). N and P through Urea DAP briquettes (60:30:0)+ 50 kg K₂O ha⁻¹.

2) Drilling at 22.5 cm : This method is followed in traditional areas of Western Maharashtra where medium to deep soil are

observed. For drilling of rice seed drill is used. Distance between two plants is 22.5 cm. Dose- 100:50:50 kg NPK ha⁻¹

3) Saguna Rice Technique (SRT) : Raised beds of 1m breadth with 8-10 cm height. Rack of 1m x 1m is placed on bed having iron pegs at 25 cm distance is placed on bed and pressed to make holes. Three seeds per hole are placed and covered carefully. Dose- 100:50:50 kg NPK ha⁻¹

4) Modified Direct Seeded Rice Technique (MDSRT) : Raised beds of 1m breadth with 8-10 cm height. Marking are made with help of rope and wooden rod at distance of 15-25 x 15-25 cm. Two seeds per hole are dibbled and covered carefully. Then Urea DAP briquettes placed in the square of 15-15 cm. N and P applied through Urea DAP briquettes (60:30:0) + 50 kg K₂O ha⁻¹.

Incidence of blast, sheath rot and scald diseases in different varieties during *kharif* season

The incidence of blast was not noticed during *kharif* season, incidence of sheath rot and scald disease was observed. The incidence of sheath rot and scald diseases were lower in *Phule Samruddhi* followed by *Indrayani*, *Bhogawati* and *Phule Radha* (Table 1).

The incidence of sheath rot and scald diseases were lower in treatment of Modified Direct Seeded Rice Technique (MDSRT). After that, it has shown increased trend in Four point agro technique (Char Sutri Method), Saguna Rice Technique (SRT) and drilling at 22.5 cm respectively.

Correlation between weather parameters and incidence of diseases

Correlation analysis of weather parameters and incidence of diseases on paddy is given as following:

On variety *Indrayani*

a) Incidence of sheath rot : Correlation analysis of incidence of sheath rot with weather parameter with different varieties presented in Table 2 is given as follows:

Correlation of incidence of sheath rot with weather parameters at 60,75,90 DAS and at harvest, revealed the significant positive correlation with T_{max} ($r = 0.864^{**}$), RH-I ($r = 0.463$), BSS ($r = 0.546$) and canopy temperature ($r = 0.532$) indicated increase in infestation of sheath rot. Further, significant negative correlation was noticed with T_{min} ($r = -0.963^{**}$) and RH-II ($r = -0.586$) indicated increase in T_{min} and RH-II decreased infestation of sheath rot. Incidence of sheath rot having positive correlation with T_{max} , RH-I, BSS and Canopy temperature while showing negative correlation with T_{min} and RH-II similar results are observed by Reddy *et al.* (2001)

b) Incidence of scald : Correlation at 45,60,75,90 DAS and at harvest revealed significant positive correlation between leaf scald incidence and T_{max} ($r = 0.897^{**}$), RH-I ($r = 0.647^*$), BSS ($r = 0.671^*$) and canopy temperature ($r = 0.751^*$) indicated that increase in their levels showed increase in infestation of scald. Thereafter, significant negative correlation was noticed with T_{min} ($r = -0.462$), RH-II ($r = -0.781^*$) indicating increase in T_{min} and RH-II decreased infestation of scald. Incidence of scald having positive correlation with T_{max} , RH-I and BSS having negative correlation with T_{min} and RH-II similar results was observed by Lamey and Williams (1972).

On variety *PhuleSamruddhi*

a) Incidence of sheath rot : Correlation analysis of incidence of sheath rot with weather parameter with different varieties is presented in Table 3.

Table 1. Incidence of blast, sheath rot and scald diseases in different treatments during *kharif* season

Treat- ment	Disease	Per cent incidence				
		Days after sowing/ transplanting				
		45	60	75	90	At ha- rvest
V ₁ M ₁	Blast	0	0	0	0	0
	Sheath rot	0	5.5	7.9	10.4	12.7
	Scald	4.9	7.7	10.7	12.8	13.4
V ₁ M ₂	Blast	0	0	0	0	0
	Sheath rot	0	7.1	8.9	11.1	15.8
	Scald	5.1	9.7	11.2	15.8	19.4
V ₁ M ₃	Blast	0	0	0	0	0
	Sheath rot	0	6.7	8.4	11	14.9
	Scald	5	.1	11	15.1	19
V ₁ M ₄	Blast	0	0	0	0	0
	Sheath rot	0	5.1	6.8	9.2	10.1
	Scald	4.5	6.5	9.3	10	13.9
V ₂ M ₁	Blast	0	0	0	0	0
	Sheath rot	0	2.3	3.1	3.4	6.9
	Scald	3.6	3.9	4.8	7.1	7.6
V ₂ M ₂	Blast	0	0	0	0	0
	Sheath rot	0	5.1	6.3	10.9	14.4
	Scald	4.5	7.6	10.8	14.4	17.4
V ₂ M ₃	Blast	0	0	0	0	0
	Sheath rot	0	4.5	5.9	9.8	13.3
	Scald	4.1	7.3	10.4	13.9	17.1
V ₂ M ₄	Blast	0	0	0	0	0
	Sheath rot	0	2.1	2.8	3.2	5.5
	Scald	3.1	3.2	3.2	4.4	6.9
V ₃ M ₁	Blast	0	0	0	0	0
	Sheath rot	0	7.6	9.3	11.9	14.8
	Scald	5.1	9.5	12.2	15.2	20.1
V ₃ M ₂	Blast	0	0	0	0	0
	Sheath rot	0	8.7	10.1	13.1	16.6
	Scald	5.5	10	13.1	16.7	21.7
V ₃ M ₃	Blast	0	0	0	0	0
	Sheath rot	0	8.1	9.3	12.3	15.3
	Scald	5.2	9.8	12.7	15.8	20.9
V ₃ M ₄	Blast	0	0	0	0	0
	Sheath rot	0	7.4	8.1	11.4	14.5
	Scald	4.9	9.1	11.8	14.4	19.6
V ₄ M ₁	Blast	0	0	0	0	0
	Sheath rot	0	8.7	11.5	14.6	17.5
	Scald	5.3	9.8	13	16.2	21
V ₄ M ₂	Blast	0	0	0	0	0
	Sheath rot	0	10.2	12.8	15.3	19.3
	Scald	5.7	10.6	13.8	17.3	22.7
V ₄ M ₃	Blast	0	0	0	0	0
	Sheath rot	0	9.3	11.9	14.9	17.8
	Scald	5.5	10.2	13.4	16.7	21.8
V ₄ M ₄	Blast	0	0	0	0	0
	Sheath rot	0	8.1	10.3	12.4	16.1
	Scald	5	9.5	12.7	15.1	20.1

Correlation of incidence of sheath rot with weather parameters at 60,75,90 DAS and at harvest, revealed significant positive correlation with T_{max} ($r = 0.712^*$) canopy temperature ($r = 0.654^*$) and BSS ($r = 0.421$) indicating increase in these weather element increased infestation of sheath rot. Further, significant negative correlation was noticed with T_{min} ($r = -0.421$), RH-I ($r = -0.561$) and RH-II ($r = -0.672^*$) indicated increase in RH-II, RH-I and T_{min} decreased infestation of sheath rot. Incidence of sheath rot having positive correlation with T_{max} , RH-I, BSS and Canopy temperature while showing negative correlation with T_{min} and RH-II similar results are observed by Amin *et al.* (1974).

b) Incidence of scald : Correlation at 45, 60, 75, 90 DAS and at harvest revealed significant positive correlation between leaf scald incidence and T_{max} ($r = 0.896^{**}$), RH-I ($r = 0.563$), BSS ($r = 0.642^*$), canopy temperature ($r = 0.982^{**}$) and GDD ($r = 0.432$) indicated that increase in T_{max} , RH-I, canopy temperature and BSS levels showed increase in infestation of scald. Thereafter, significant negative correlation was noticed with T_{min} ($r = 0.723^*$) and RH-II ($r = -0.376$) indicated increase in T_{min} and RH-II decreased infestation of scald.

Incidence of scald having positive correlation with T_{max} , RH-I, BSS and GDD and having negative correlation with T_{min} and RH-II similar results was observed by Peregrine *et al.* (2009).

Table 2. Correlation between weather parameters and diseases of paddy on variety *Indrayani*

Weather parameter	Sheath rot				Scald				
	Days after sowing / transplanting								
	60	75	90	At harvest	45	60	75	90	At harvest
T_{max}	0.864**	0.512	0.479	0.768*	0.897**	0.542	0.479	0.841**	0.643*
T_{min}	-0.963**	-0.673*	-0.649*	-0.572	-0.462	-0.400	-0.541	-0.521	-0.634*
RH-I	0.463	0.468	0.389	0.487	0.647*	0.537	0.871**	0.399	0.541
RH-II	-0.586	-0.398	-0.567	-0.652*	-0.781*	-0.452	-0.562	-0.458	-0.771*
BSS	0.546	0.534	0.673*	0.578	0.671*	-0.681*	0.541	-0.431	0.571
Canopy temp.	0.532	0.587	0.458	0.547	0.751*	0.921**	0.534	0.462	0.673*

Table 3. Correlation between weather parameters and diseases of paddy on variety *PhuleSamruddhi*

Weather parameter	Sheath rot				Scald				
	Days after sowing / transplanting								
	60	75	90	At harvest	45	60	75	90	At harvest
T_{max}	0.712*	0.422	0.725*	0.805**	0.896**	0.924**	0.642*	0.903**	0.732*
T_{min}	-0.421	-0.463	-0.783*	-0.471	-0.723*	-0.421	-0.434	-0.487	-0.768*
RH-I	-0.561	0.437	0.653*	0.672*	0.563	0.549	0.453	0.576	-0.467
RH-II	-0.672*	-0.367	-0.289	-0.431	-0.376	-0.287	-0.432	-0.352	-0.642*
BSS	0.421	0.763*	0.298	0.562	0.642*	0.562	0.783*	-0.561	0.462
Canopy Temp.	0.654*	0.492	0.497	0.280	0.982**	0.785*	0.634	0.673*	0.396

On variety *Bhogawati*

a) Incidence of sheath rot : Correlation analysis of incidence of sheath rot with weather parameter with different varieties is presented in Table 4.

Correlation of incidence of sheath rot with weather parameters at 60, 75, 90 DAS and at harvest, revealed significant positive correlation with T_{max} ($r = 0.783^*$), RH-I ($r = 0.479$) and canopy temperature ($r = 0.843^{**}$) indicated increase in these weather elements increased infestation of sheath rot. Further, significant negative correlation was noticed with T_{min} ($r = -0.689^*$), RH-II ($r = -0.576$), BSS ($r = -0.543$) indicated increase in T_{min} , RH-II and BSS decreased infestation of sheath rot. Incidence of sheath rot having positive correlation with T_{max} , RH-I, BSS and Canopy temperature while showing negative correlation with T_{min} and RH-II similar results are observed by Reddy *et al.* (2001)

b) Incidence of scald : Correlation at 45, 60, 75, 90 DAS and at harvest revealed significant positive correlation between leaf scald incidence and T_{max} ($r = 0.786^{**}$), RH-I ($r = 0.831^{**}$), BSS ($r = 0.533$) and canopy temperature ($r = 0.673^*$) indicated that increase in T_{max} , RH-I, canopy temperature and BSS levels showed increase in infestation of scald.

Thereafter, significant negative correlation was noticed with T_{min} ($r = -0.546$) and RH-II ($r = -0.561$) indicated increase in T_{min} and RH-II decreased infestation of scald. Incidence of scald having positive correlation with T_{max} , RH-I and BSS having negative correlation with T_{min} and RH-II similar results was observed by Lamey and Williams (1972).

On variety *PhuleRadha*

a) Incidence of sheath rot : Correlation analysis of incidence of sheath rots with weather parameter at different varieties is presented in Table 5.

Correlation of incidence of sheath rot with weather parameters at 60,75,90 DAS and at harvest, revealed significant positive correlation with T_{max} ($r = 0.953^{**}$), BSS ($r = 0.541$) and canopy temperature ($r = 0.378$) indicated increase in these weather elements increased infestation of sheath rot. Further, significant negative correlation was noticed with T_{min} ($r = -0.643^*$), RH-I ($r = -0.576$) and RH-II ($r = -0.679^*$) indicated increase in T_{min} , RH-I and RH-II decreased infestation of sheath rot. Incidence of sheath rot having positive correlation with T_{max} , RH-I, BSS and Canopy temperature while showing negative correlation with T_{min} and RH-II similar results are observed by Amin *et al.* (1974).

Table 4. Correlation between weather parameters and diseases of paddy on variety *Bhogawati*

Weather parameter	Sheath rot				Scald				
	Days after sowing / transplanting								
	60	75	90	At harvest	45	60	75	90	At harvest
T_{max}	0.783*	0.634*	0.856**	0.834**	0.786*	0.982**	0.823**	0.765*	0.799*
T_{min}	-0.689*	-0.542	0.856**	-0.753*	-0.546	0.542	-0.579	-0.568	-0.687*
RH-I	0.479	0.371	-0.574	0.553	0.831**	0.645*	0.658*	0.663*	-0.539
RH-II	-0.576	-0.287	-0.532	-0.774*	-0.561	-0.368	-0.867**	-0.589	-0.468
BSS	-0.543	0.659*	0.374	0.989**	0.553	0.832**	0.546	-0.541	0.691*
Canopy temp.	0.843**	0.567	0.524	0.514	0.673*	0.534	0.712*	0.386	0.734**

Table 5. Correlation between weather parameters and diseases of paddy on variety *PhuleRadha*

Weather parameter	Sheath rot				Scald				
	Days after sowing / transplanting								
	60	75	90	At harvest	45	60	75	90	At harvest
T _{max}	0.953**	-0.713*	0.658*	0.879**	0.682*	-0.937**	0.932**	0.741*	0.941**
T _{min}	-0.643*	-0.671*	-0.567	-0.742*	-0.572	-0.542	-0.674*	-0.861**	-0.594
RH-I	-0.576	0.764*	0.498	0.552	-0.461	0.689*	0.563	0.648*	0.743*
RH-II	-0.679*	-0.564	-0.890**	-0.345	-0.571	-0.421	-0.475	-0.513	-0.541
BSS	0.541	0.475	0.451	-0.387	0.768*	0.472	0.561	-0.549	0.476
Canopy temp.	0.378	0.671*	0.362	0.348	0.713*	0.684*	0.852**	0.641*	0.453

* Significant at 5% level, ** Significant at 1% level

b) Incidence of scald : Correlation at 45, 60, 75, 90 DAS and at harvest revealed significant positive correlation between leaf scald incidence and T_{max} (r= 0.682*), BSS (r= 0.768*) and canopy temperature (r=0.713*) indicated that increase in T_{max}, BSS and canopy temperature levels showed increase in infestation of scald. Thereafter, significant negative correlation was noticed with T_{min} (r = -0.572), RH-I (r = -0.461) and RH-II (r= -0.571) indicated increase in T_{min}, RH-I and RH-II decreased infestation of scald. Incidence of scald having positive correlation with T_{max}, RH-I and BSS having negative correlation with T_{min} and RH-II similar results was observed by Peregrine *et al.* (2009).

Conclusions

From data it was revealed that the disease incidence was lower in paddy variety VDN-99-29 (*Phule Samruddhi*) followed VDN-3-51-18 (*Indrayani*) and higher incidence with IET-13549 (*Bhogawati*) and RDN-99-1 (*Phule Radha*). Disease Incidence was more with drilling at 22.5 cm and lower with Modified Direct Seeded Rice Technique (MDSRT). There was positive correlation between maximum

temperature, morning relative humidity, BSS, growing degree day and canopy temperature with incidence of leaf folder and brown plant hopper but negative correlation with minimum temperature, evening relative humidity. Stem borer incidence was not observed during the period of investigation. Therefore, It would be suggested to Farmers to go for adopt VDN-99-29 (*Phule Samruddhi*) variety ,sowing with Modified Direct Seeded Rice Technique (MDSRT) for for minimum attack of rice disease with high yield

References

- Amin, K. S., Sharma, B. D. and Das, C. R. 1974. Occurance in india of sheath rot of rice caused by *Acrocyndrium*. *Plant Disease Reporter*. 58(4): 358-360.
- Lamey, H. A. and Williams, R. 1972. J. leaf scald of rice in west Africa. *Plant Disease Reporter*. 56(2): 106-107.
- Reddy, M. M., Reddy, C.S. and Reddy A.G.R. 2001. Influence of weather parameters and insect pest populations on incidence and development of sheath rot of rice. *Indian Phytopathology*. 54(2): 23-44.
- Peregrine, W. T. H., Kassim bin Ahmad and Bakti bin Yunton. 2009. Some Observations on Leaf Scald (*Rhynchosporiumoryzae* Hashioka & Yokogi) in Brunei, *PANS Pest Articles & News Summaries*, 20(2): 177-180.