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Evaluation of Certain Resistance Inducing Chemicals against Sheath Blight Incidence in Paddy (*Oryza sativa* L.)

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Abstract: Sheath blight disease of caused by *Rhizoctonia solani* is one of the most destructive phytopathogen of rice and has a yield ubiquitous occurrence in all the rice growing, countries. The foliar application at certain resistance inducing chemical, namely, acibenzolar, NAA, salicylic acid and jasmonic acid on the control of sheath blight disease incidence in IR-50 rice indicated the improved efficacy at salicylic acid to other chemical induced systemic resistance to Pathogen by SA-treatment at root or soil. The present study discovered that salicylic acid was found to decrease the sheath blight incidence in IR-50 rice and it might be clue to the salicylic acid augmented induced systemic resistance of rice plant against *Rhizoctonia solani.* The results concluded the efficiency of salicylic acid in reducing the sheath blight incidence by 19.10 per cent and 28.12 per cent at 0.10 and 0.075 per cent concentrations, correspondingly.

Key words: Sheath Blight · *Rhizoctonia solani* · Chemicals and Rice

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important staple food for over two billion people in Asia and for hundreds of million in Africa and Latin America. To feed the ever increasing population of these regions the world's annual rice production must be increased from the present 560 to 750 million tones by 2020 [1]. The future increase in rice production has to come from the same or even reduced land area and the productivity yield must be greatly enhanced by providing additional nutrient input and through effective control at phytopathogens [2].

Sheath blight disease of rice was first described from Japan in 1910 and now known to occur in most countries in Asia caused by *Rhizoctonia solani*. For the first time in India, the disease was reported by Paracer and Chaha [3]. Kanniyan and Prasad [4] reported the intensity and severity of sheath blight disease in Tamil Nadu. The disease was mainly confined to lower sheath and was known to be soil borne. Kannaiyan and Prasad [5] have reported for the first time the seed borne nature of the disease. Ou [6] reported that when the disease reaches the flag leaves, loss was estimated to be 25 per cent.

The *Rhizoctonia solani* germinate and initiate infection once they get in contact with the rice plant. The fungus penetrates through the cuticle or the stomatal slit. Infection pegs are formed from each lobe of the lobate appressorium of infection cushion. The mycelium grows from the outer surface of the sheath going through the sheath edge and finally through the inner surface [7]. Primary lesions are formed while the mycelium grows rapidly on the surface of the plant tissue and inside its tissue. It proceeds upwards and laterally to initiate formation of the secondary lesions. Studies at IRRI showed that sheath blight causes a yield loss of 6% in tropical Asia [8].

Biocontrol of sheath blight disease management has, so far, proved to be inefficient in bringing down the disease incidence below economic threshold level (ETL) [9]. Hence, the application of systemic resistance inducing chemicals along with biocontrol agents would be the suitable alternative strategy to improve the sheath blight disease management in rice. Several chemicals namely, salicylic acid (1) acetyl salicylic acid (2) jasmonic acid (3) and oxalic acid (4) have been shown to induce resistance in crop plants [10].

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MATERIALS AND METHODS

Rectangular cement pots of size 18" x 12"x12" were filled with 45 kg of paddy field soil flooded with water for 2 days and brought to fine puddle conditions. Seeds of the rice variety IR-50 were loosely packed separately in small gunny bag and soaked in water for 12 hrs. Then the bags were subsequently kept in dark place after covering with wet gunny bags to ensure optimum condition for germination. The seeds germinated within about 24 hrs. after soaking. The pre-germinated seeds of IR-50 rice were sown in rows in pots separately. On the 5th day of sowing the seedlings were thinned to get 50 numbers per pot. The seedlings were raised under wet conditions and the age was counted from the time of sowing.

After the sowing of rice seeds, four resistance inducing chemicals, namely, Acibenzolar, Naphthaline acetic acid, Jasmonic acid and Salicylic acid at 0.075 and 0.1 per cent level, were sprayed individually on 15th DAS one day prior to the challenge inoculation of *Rhizoctonia solani* to rice plant. The observations were recorded one week after the challenge inoculation of *Rhizoctonia solani* and expressed as percentage disease incidence as detailed elsewhere in the text.

RESULTS AND DISCUSSION

Systemic resistance induced against the pathogen, through exogenous application of the inducers *viz.,* Salicylic acid, Acibenzolar, Napthaline acetic acid and Jasmonic acid were studied and the results are presented in Table 1. The results revealed the efficiency of salicylic acid in reducing the sheath blight incidence by 19.10 per cent and 28.12 per cent at 0.10 and 0.075 per cent concentrations, respectively, followed by Acibenzolar, Napthaline acetic acid and Jasmonic acid.

Table 1: Effect of foliar application of certain resistance inducing chemicals on sheath blight incidence of paddy

Chemicals	Dose (%)	% Disease incidence
Control	-	74.5
Acibenzolar	0.075	36.9
Acibenzolar	0.10	36.3
Napthaline acetic acid	0.075	37.5
Napthaline acetic acid	0.10	34.9
Salicylic Acid	0.075	28.12
Salicylic Acid	0.10	19.1
Jasmonic Acid	0.075	37.8
Jasmonic Acid	0.10	37.5
SE_D	-	5.00
CD (P = 0.05)	-	10.04

The studies on the effect of foliar application at certain resistance inducing chemical, namely, acibenzolar, NAA, salicylic acid and jasmonic acid on the control of sheath blight disease incidence in IR-50 rice indicated the improved efficacy at salicylic acid to other chemical induced systemic resistance to Pathogen by SA-treatment at root or soil level has been reported in tobacco, radish and arubidiopsis [11-13]. In the present study also, salicylic acid was found to decrease the sheath blight incidence in IR-50 rice and it might be clue to the salicylic acid augmented induced systemic resistance of rice plant against *Rhizoctonia solani* as suggested by Meyer and Hofte [14].

CONCULSION

From the study it was concluded the efficiency of salicylic acid in reducing the sheath blight incidence by 19.10 per cent and 28.12 per cent at 0.10 and 0.075 per cent concentrations respectively, followed by Acibenzolar, Napthaline acetic acid and Jasmonic acid. Based on the consequences salicylic acid is a most biocontrol agent of control the *Rhizoctonia solani.*

REFERENCES

1. Saranraj, P., P. Sivasakthivelan and S. Siva Sakthi, 2013. Prevalence and production of plant growth promoting substance by *Pseudomonas fluorescens* isolated from paddy rhizosphere soil of Cuddalore district, Tamil Nadu, India. African Journal of Basic and Applied Sciences, 5(2): 95-101.
2. Sivasakthi, S., D. Kanchana, G. Usharani and P. Saranraj, 2013. Production of plant growth promoting substance by *Pseudomonas fluorescens* and *Bacillus subtilis* isolated from paddy rhizosphere soil of Cuddalore district, Tamil Nadu, India. International Journal of Microbiology Research, 4(3): 227-233.
3. Paracer, C.S. and D.S. Chahal, 1963. Sheath blight of rice caused by *Rhizoctonia solani* kuhn, a new record in India. Current Science, 32: 328-329.
4. Kanniyan, S. and N. Prasad, 1976. Plant responses to insect herbivory: The emerging molecular analysis. Annual Reviews in Plant Biology, 53: 299-328.
5. Kanniyan, S. and N. Prasad, 1978. Effect of potassium on the incidence of sheath blight of rice. Indian Potassium Journal, 3: 23.
6. Ou, S.H., 1985. Rice Disease. Common wealth Mycological Institute, Kew. Surrey, England, U.K. pp: 380.

7. Venkata Ratnam, S., P. Narayan Reddy, K. Chandirasekhra Rao, S. Krishnam Raju and J. Hemanatha Kumar, 2001. Effect of Salicylic Acid and Bion Seed treatment in induction of Systemic resistance against Sunflower leaf blight, Alternaria helianthus (Hansf) Tub. Et Nish. Indian Journal of Plant Protection, 29: 79-81.
8. White, R.F., 1979. Acetylsalicylic acid (aspirin) induces resistance to tobacco mosaic virus in tobacco. Virology, 99: 410-412.
9. Cohen, Y., U. Gisi and T. Niderman, 1993. Local and Systematic protection against *Phytophthora infestans* induced in potato and tomato plants by jasmonic acid metyl ester. Phytopathology, 83: 1054-1062.
10. Toal, E.S. and P.W. Jones, 1999. Induction of systemic resistance to *Sclerotinia sclerotioium* by oxalic acid in oilseed rape. Plant Pathology, 48: 759-767.
11. Enedi, A.J., N. Yalpani, P. Silverman and I. Raskin, 1992. Localization, conjugation and function of salicylic acid in tobacco during the hypersensitive reaction of mosaic virus Proc. Natl. Acad. Sci. U.S.A., 89: 2480-2484.
12. Leeman, F., M. Damouden, J.A. Vanpelt, F.P.M. Dirkx, H. Steijl, P.A.H.M. Bakker and B. Schippers, 1995. Iron availability affects induction of systemic resistance of *Fusarium* wilt of radish by *Pseudomonas fluorescens*. Phytopathology, 86: 149-155.
13. Van Loon, L.C. and J.F. Antoni, 1982. Comparison the effects of salicylic acid and ethephon with virus induced hypersensitivity and acquired resistance in tobacco. Netherland Journal of Plant Pathology, 88: 237-256.
14. Meyer, G.D. and M. Hofte, 1997. Salicylic acid produced by Rhizobacterium *Pseudomonas aeruginosa* $FNSK_2$ Induced resistance against leaf infection by *Botrytis cinerea* on bean. Phytopathology, 87: 588-593.