Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.8221

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **4 (2):** 362-367 (2016)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Effect of Seed Treatment with Non-conventional Chemicals, Plant Extracts and homoeopathic Drugs on Sheath rot of Rice

M.B. Thakur[1], MD Reyaz Ahmad[1*], Ram Babu Sharma[2] and Shanti Bhushan[1]

[1]VKS College of Agriculture Dumraon, Buxar (BAU Sabour) Bihar

[2]KVK Piprakothi, East Champaran, (RAU Pusa Samastipur) Bihar

*Corresponding Author E-mail: drreyazamed@gmail.com

Received: 8.02.2016 | Revised: 28.03.2016 | Accepted: 4.04.2016

ABSTRACT

The experiment was conducted to know the effect of seed treatment with non-conventional chemicals, plant extracts and homoeopathic drugs on the incidence of disease and production of rice. All the selected chemicals plant extracts and homoeopathic drugs were able to decrease the disease severity, yield and 1000-grain weight in comparison to untreated control considerably in both the years. Data presented in Table 1 and 2 clearly indicated that non-conventional chemicals (Ferrous sulphate, Mercuric chloride, 2, 4-D, Sodium azide, Zinc sulphate, Copper sulphate and Cysteine), plant extracts (Neem leaf and Vinca leaf extracts) and Homoeopathic drugs (Sulphur and Thuja) can be used as seed treatment to reduce the disease severity by 20-30 per cent and to get considerable 15-26 per cent increase in yield and 1000-grain weight.

Keywords: *Rice, Sheath rot, Seed Treatment Non-conventional Chemicals, Plant Extracts and homoeopathic Drugs*

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important and widely grown crop for more than two third of the population of Eastern and South-East Asian, African and South American countries. Various factors responsible for low yield of the crop like a no of diseases play a vital role. Rice is affected by a number of diseases. So far over 35 fungal, 8 bacterial and 20 viral and mycoplasmal diseases have been reported on rice (Ou, 1984) which takes a heavy loss of its production

Seed treatment has been a basic and the most important input for sustaining the growth in productivity and production as well since almost majority of the food crops are grown from seed (Schwinn, 1994). The importance of seed treatment is of paramount importance in developing country like India where the increasing population and gross domestic product solely depend on Agriculture (Tyagi, 2012).

Cite this article: Thakur, M.B., Ahmad, M.R., Sharma, R.B., & Bhushan, S. (2016). Effect of Seed Treatment with Non-conventional Chemicals, Plant Extracts and homoeopathic Drugs on Sheath rot of Rice, *Int. J. Pure App. Biosci.* **4(2):** 362-367 (2016). doi: http://dx.doi.org/10.18782/2320-7051.8221

The chemical application in contrast to none conventional Chemicals, Homoeopathic drugs and Botanicals have their limitation like higher cost of production, impact on non target organism, development of pest resistance, resurgence of Pathogen, food and feed pollution and environmental pollution, health hazards and Phytotoxicity towards plant system and toxicity and animals and human etc (Rahman et.al., 2008). The status of developing durable resistant varieties had been found very slow and unreliable in spite of genetic engineering (Reddy, 2013).

Sheath rot, caused by *Sarocladium oryzae* (Games and hawksworth, 1975) is a potential devastating disease of rice in all rice growing area of the world. (Naeimi et al, 2003). Crop losses usually ranged from negligible to 57.4 per cent depending on the extent of severity and crop stages at which the disease appears under congenial and environmental condition (Singh et al., 1985).

Although, control strategy for Sheath rot of rice have centered around the use of foliar chemical fungicides(Groth et al, 1990),their use is limited due to perceived environmental problems and potential risk of emergence of the races pathogen populations that could become resistant. Induced resistance can also be developed in susceptible plant host against its pathogen by prior treatment with many non-conventional often non-toxic or only mildly toxic chemicals (Wain and Carter, 1972). Biologically induced resistance may be effective against more than one pathogen often of different kinds and may persist for long. Seed born inoculums of *Sarocladium oryzae* could be managed by seed treatment with Non-conventional Chemicals, Plant Extracts and homoeopathic Drugs as in alternative disease management strategy.

MATERIALS AND METHODS

An exploratory field trial was conducted in Randomized Block Design at Dumraon with three replication during *Kharif* 2015 and 2016, Considering these limitations with the growing population of the world it has been found quite imperative to develop and ecofriendly tools which alone or in combination with others measure could bring about high level of reduction of inoculum potential simultaneously ensuring sustainability in agricultural production, cost effectiveness, easier delivery system and healthy ecosystem, seed treatment has been found one of the best tool for managing the seed and soil born diseases of the crops (Sanjeev Kumar, 2012).

using fifteen non-conventional chemicals, five plant extract and five homoeopathic drugs as well as one conventional chemicals for comparison, to assess their relative effectiveness of seed treatment in controlling sheath rot infection in susceptible rice plant (Pankaj) under field condition.

(a) Seed treatment with non-conventional chemicals

For seed treatment selected chemicals were used. Half ml stock solution of each selected chemicals were mixed with 49.5 ml of sterilized water separately to achieved required 10^{-2} M concentration. The required amount of rice seed were first surface sterilized with 0.1 per cent Mercuric chloride solution and then soaked in the 50 ml of solution for 24 hours.

(b) Treatment with plant extracts

For seed treatment with plant extracts, cold water extracts of above mentioned plant were used. Standard plant extracts were prepared as per method described under section 3.3.2. The 2.5 ml extract was diluted to 50 ml with sterilized distilled water separately to achieved required 5 per cent concentration and used as test concentration for seed treatment.

(c) Treatment with homoeopathic drugs

For seed treatment selected homoeopathic drugs were used. Mother tincture of each homoeopathic drug (1.25 ml) was mixed with 48.75 ml of sterilized distilled water separately to achieved required 500 ppm concentration

and used as test concentration for seed treatment. Seed treated with distilled water and Bavistin (1000 ppm) separately served as checks.

After soaking the seeds for 24 hours, in test concentration were dried under shade and directly sown in the seedbed in the field. Observation and data recording on disease severity was calculated after 110 days with following formula by using 0-9 scale.

$$PDI = \frac{\text{Sum of all numerical rating X 100}}{\text{Total no. of plant graded X Maximum graded}}$$

Bundles of individual plots were threshed separately and grains obtained were weighed separately. One thousand grain were counted from the produce of each plot and weighed to find out the 1000 grain weight (Test weight).

RESULT AND DISCUSSION

Data presented in Table 1 and 2 clearly indicated that all the chemicals, plant extracts and homoeopathic drugs were able to decrease the disease severity, increase the yield and 1000 grain weight in comparison to untreated control considerably in both the years.

In the year 2015, about 10-30 per cent disease control could be achieved by seed treatment with non-conventional chemicals, plant extracts and homoeopathic drugs. Out of 25 non-conventional chemicals/plant extracts/ homoeopathic drugs, 12 namely; Calcaria carb, Ferrous sulphate, Mercuric chloride, 2,4-D, Vinca, Sodium azide, Sulphur, Thuja, Zinc sulphate Copper sulphate, Cysteine and Neem could reduced disease severity from 48.33 (untreated check) to 33.66-38.33 per cent and gave 20-30 per cent disease control and increase yield by 19-26 per cent in comparison to untreated check. All these treatment did not differ significantly among them; however, they were inferior to Bavistin seed treatment which reduced disease severity to 22.33 per cent.

Although seed treatment with Neem extract, Cystiene and Copper sulphate resulted in significantly higher disease severity as compared to Bavistin treated plot but the yields obtained in all the four treatments (Neem extracts, Cysteine, Copper sulphate and Bavistin) were statistically at par. Almost similar trend was observed in the year 2016 also (Table 2).

Data presented in Table 1 and 2 clearly indicated that non-conventional chemicals (Ferrous sulphate, Mercuric chloride, 2,4-D, Sodium azide, Zinc sulphate, Copper sulphate and Cysteine), plant extracts (Neem leaf and Vinca leaf extracts) and Homoeopathic drugs (Sulphur and Thuja) can be used as seed treatment to reduce the disease severity by 20-30 per cent and to get considerable 15-26 per cent increase in yield and 1000-grain weight. However, these treatments were inferior to Bavistin in which about 49-54 percent disease control was observed with an increase in yield by 29-36 percent.

During the last three decades, there had been a number of reports of successful induction of resistance in plant hosts by treatment with selected non-conventional chemical (Langcake, 1981) but rarely such promising initial results have been followed up with any well planned intensive experimentation with the idea to include this approach into the schedule of regular practices for plant disease control.

Table 1: Effect of seed treatment with non-conventional chemicals, plant extract and Homoeopathic drugs on sheath rot of rice during *Kharif* 2015

Sl. No.	Chemicals/Plant extract/ Homoeopathic drugs	Concentration	Disease severity	Disease control over check (%)	Yield (q/ha)*	Yield increase over check (%)	1000-grain weight (g)*
1.	Nickel chloride	10^{-2} M	41.33 ^{eft}	14.48	37.03$^{def\ **}$	14.18	22.63$^{bcd\ **}$
2.	Copper sulphate	10^{-2} M	34.33^{b}	28.97	40.60^{abcd}	25.19	23.63^{abc}
3.	Zinc sulphate	10^{-2} M	34.66^{b}	28.28	39.50^{bcde}	21.80	23.45^{abc}
4.	Mercuric chloride	10^{-2} M	38.00^{bcdef}	21.37	38.61^{bcdef}	19.06	23.17^{abcd}
5.	Ferrous sulphate	10^{-2} M	38.00^{bcdef}	21.37	38.61^{bcdef}	19.06	23.16^{abcd}
6.	Sodium molybdate	10^{-2} M	42.33^{fg}	12.41	35.73^{fg}	10.10	22.46^{cd}
7.	Sodium azide	10^{-2} M	37.33^{bcde}	22.76	39.06^{bcdef}	20.44	23.24^{abcd}
8.	Diphenylamine	10^{-2} M	39.33^{cdefg}	18.62	37.90^{bcdef}	16.87	23.00^{abcd}
9.	Methionine	10^{-2} M	41.00^{defg}	15.17	37.16^{cdef}	14.59	22.71^{bcd}
10.	Tryptophan	10^{-2} M	40.33^{defg}	16.55	37.66^{bcdef}	16.13	22.86^{bcd}
11.	Lysine	10^{-2} M	41.00^{defg}	15.17	37.33^{bcdef}	15.11	22.80^{bcd}
12.	Sodium sulphite	10^{-2} M	39.33^{cdefg}	18.62	38.03^{bcdef}	17.27	23.09^{abcd}
13.	Cysteine	10^{-2} M	34.00^{b}	29.65	40.66^{abc}	25.38	23.67^{abc}
14.	2,4-D	10^{-2} M	37.66^{bcdef}	22.08	38.89^{bcdef}	19.92	23.19^{abcd}
15.	IBA	10^{-2} M	43.33^{g}	10.35	34.53^{fg}	6.48	22.16^{d}
16.	Calcaria carb	500 ppm	38.33^{bcdef}	20.69	38.56^{bcdef}	18.90	23.10^{abcd}
17.	Kali iodide	500 ppm	41.33^{efg}	14.48	36.83^{ef}	13.57	22.63^{bcd}
18.	Thuja	500 ppm	36.33^{bcd}	24.83	39.13^{bcdef}	20.66	23.32^{abcd}
19.	China	500 ppm	41.00^{defg}	15.17	37.16^{cdef}	14.59	22.64^{bcd}
20.	Sulphur	500 ppm	36.33^{bcd}	24.83	39.06^{bcdef}	20.44	23.30^{abcd}
21.	Tulsi leaf	5 %	42.33^{fg}	12.41	36.02^{efg}	11.07	22.50^{cd}
22.	Dhatura	5 %	39.33^{cdefg}	18.62	37.80^{bcdef}	16.56	23.00^{abcd}
23.	Ashoka	5 %	39.66^{defg}	17.94	37.80^{bcdef}	16.56	22.87^{bcd}
24.	Neem	5 %	33.66^{b}	30.35	40.93^{ab}	26.21	23.84^{ab}
25.	Vinca	5 %	37.66^{bcdef}	22.08	39.03^{bcdef}	20.35	23.20^{abcd}
26.	Bavistin	0.1 %	22.33^{a}	53.80	44.03^{a}	35.77^{a}	24.16^{a}
27.	Water	-	48.33^{h}	-	32.43^{g}	-	19.37^{e}
	S.Em		1.77		1.30		0.46
	CD (P=0.05)		4.91		3.62		1.28

* Each value is an average of three replications.

** Values followed by the same letter do not differ significantly at 5 per cent level of significance.

Table 2: Effect of seed treatment with non-conventional chemicals, plant extract and Homoeopathic drugs on sheath rot of rice during *Kharif* 2016

Sl. No.	Chemicals/Plant extract/ Homoeopathic drugs	Concentrations	Disease severity	Disease control over check (%)	Yield (q/ha)*	Yield increase over check (%)	1000-grain weight (g)*
1.	Nickel chloride	10^{-2} M	39.00 ^{efg}	12.02	37.77 $^{bcdef\ **}$	11.38	22.83$^{bc\ **}$
2.	Copper sulphate	10^{-2} M	32.00 ^{bc}	27.81	41.08 ^{abcd}	21.14	23.66 ^{ab}
3.	Zinc sulphate	10^{-2} M	32.33 ^{bc}	27.07	40.58 ^{abcd}	19.67	23.60 ^{ab}
4.	Mercuric chloride	10^{-2} M	35.00 ^{bcdef}	21.05	39.39 ^{bcd}	16016	23.34 ^{bc}
5.	Ferrous sulphate	10^{-2} M	35.00 ^{bcdef}	21.05	39.24 ^{bcd}	15.72	23.33 ^{bc}
6.	Sodium molybdate	10^{-2} M	40.33 ^{g}	9.02	36.91 ^{def}	8.85	22.66 ^{bc}
7.	Sodium azide	10^{-2} M	34.33 ^{bcde}	22.56	39.85 ^{abcd}	17.52	23.46 ^{abc}
8.	Diphenylamine	10^{-2} M	37.33 ^{defg}	15.79	38.91 ^{bcd}	14.74	23.14 ^{bc}
9.	Methionine	10^{-2} M	38.00 ^{defg}	14.28	38.21 ^{bcde}	12.68	23.00 ^{bc}
10.	Tryptophan	10^{-2} M	37.66 ^{defg}	15.05	38.35 ^{bcde}	13.09	23.00 ^{bc}
11.	Lysine	10^{-2} M	38.00 ^{defg}	14.28	38.32 ^{bcde}	13.01	23.00 ^{bc}
12.	Sodium sulphite	10^{-2} M	36.66 ^{defg}	17.30	38.94 ^{bcd}	14.83	23.16 ^{bc}
13.	Cysteine	10^{-2} M	31.66 ^{b}	28.58	41.66 ^{abc}	22.85	23.70 ^{ab}
14.	2,4-D	10^{-2} M	34.66 ^{bcdef}	21.81	39.55 ^{bcd}	16.63	23.36 ^{abc}
15.	IBA	10^{-2} M	40.33 ^{g}	9.02	34.72 ^{ef}	2.39	22.37 $^{c\ bc}$
16.	Calcaria carb	500 ppm	36.00 ^{bcdefg}	18.79	39.02 ^{bcd}	15.07	23.23 ^{bc}
17.	Kali iodide	500 ppm	39.33 ^{fg}	11.28	37.61 ^{cdef}	10.91	22.77 ^{abc}
18.	Thuja	500 ppm	33.33 ^{bcd}	24.81	40.36 ^{abcd}	19.02	23.46 ^{bc}
19.	China	500 ppm	39.00 ^{efg}	12.02	38.12 ^{bcd}	12.42	22.96 ^{abc}
20.	Sulphur	500 ppm	33.66 ^{bcd}	24.07	40.17 ^{abcd}	18.46	23.46 ^{bc}
21.	Tulsi leaf	5 %	40.33 ^{g}	9.02	37.26 ^{def}	9.88	22.75 ^{bc}
22.	Dhatura	5 %	37.33 ^{defg}	15.79	38.75 ^{bcde}	14.27	23.10 ^{bc}
23.	Ashoka	5 %	37.33 ^{defg}	15.79	38.38 ^{bcde}	13.18	23.10 ^{bc}
24.	Neem	5 %	30.66 ^{b}	30.84	41.85 ^{ab}	23.41	23.70 ^{bc}
25.	Vinca	5 %	34.66 ^{bcdef}	21.81	39.61 ^{bcd}	16.81	23.38 ^{abc}
26.	Bavistin	0.1 %	22.66 ^{a}	48.88	43.85 ^{a}	29.31	24.58 ^{a}
27.	Water	-	44.33 ^{h}	-	33.91 ^{f}	-	21.13 ^{d}
	S.Em		1.78		1.51		0.44
	CD (P=0.05)		4.95		4.18		1.22

* Each value is an average of three replications.

** Values followed by the same letter do not differ significantly at 5 per cent level of significance.

Metal salts *viz.* Ferric chloride, cadmium chloride and nickel nitrate significantly reduced brown spot infection when applied as pre-sowing wet seed treatment are very dilute (10^{-4} M) concentration (Giri & Sinha, 1983a). Ferric chloride, Cadmium chloride and cupric chloride have been reported to be very effective against blast of rice (Sinha & Sengupta, 1986). Against all the rice disease mentioned above, the induced protective effect was found to persist for fairly long periods. Management of almost all soil born diseases showed the appreciable results while treating the seed with micronutrients (Farooque et al., 2012). Various seed treatment technology against sheath blight disease of rice has been used and found satisfactory result (Amin et al, 2014) and Riazuddin et al., 2013)

Plant growth regulators constitute an important group of chemical with very significant effect on host metabolism. Rice plants developed resistance to sheath rot when treated with gibberellic acid and the treated plants responded to inoculation with increased production of a phytoalexin (Ghosal and Purkayastha, 1984).

Reports on plant diseases control by the use of plant extracts and plant products as seed treatment are extremely limited. Ali (1993) showed that substantial reduction of Brown spot of rice could be achieved by seed treatment with plant extracts, viz. immature and mature Neem leaf, immature and partly mature coconut water and garlic extracts in water and methanol and plant products viz. Bioneem & achook. Nahid (2007) also reported the importance of seed treatment garlic against all seed born diseases of rice. Wher as Kumar et al., (2016) and Allis and Raw, (1987) tried several botanicals against brown leaf spot disease of rice and found reliable results as in our experiment. Moreover, Gayatri et al., (2014) advocated the use of neem extract against enhancement of growth parameter and lowering the wilt and leaf spot disease of Brinjal.

Saxena et al. (1987) have reported that Thuja, Sulpher and calecaria carb were effective against seed born fungi of *Abelmoschus esculentus* and all fungi associated with the seed. We could not found more literature when homoeopathic drugs have been used as seed treatment. However, homoeopathic drugs are known to inhibit the seed born fungi (Khanna et al., 1989).

REFERENCES

Ali, M. (1993). Use of plant extracts as a non-conventional approach to plant disease control. M.Sc. (Ag.) Thesis, BCKV. Mohanpur, West Bengal, India.

Allis, D. and Rao, A.V. (1987). Antifungal effects of Plant extract on *Drechslera oryzae* in rice. *Int. Rice Res. News L.* 12(2): 28.

Amin, M.R; Faruq, A. N; Islam, M.S; Chaoudhary, S.R. and Khalequ, M.A. (2014). Evaluation of seed Treatment against sheath blight disease of hybrid rice under natural Epiphytotics condition. *Journal of Experimental Bioscience*.

Davis, D. and Dimond, A.E. (1953). Inducing disease resistance with plant regulators. *Phytopathology,* 43: 137-140.

Farooque, M.; Wahid, A. and Siddique, K.H.M. (2012). Micronutrient application Through Seed treatment – A Review. *Journal of Soil Science and Plant Nutrition*. 12(1): 125-142.

Gams, W. and Hawksworth D.L. (1975). Kavaka, 3: 57-61.

Gayatri Nahakand Rajani Kanta Sahu (2014). Bio efficacy of leaf extract of Neem (*Azadirachta indica* A Juss) on growth parameters, wilt and leaf spot disease of Brinjal. Research Journal of Medicinal Plants.8:269-276.

Ghosal, A. and Purkayastha, R.P. (1984). Elicitation of momilactone by gibberelline in rice. *Curr. Sci.,* 53: 506-507.

Giri, D.N. and Sinha, A.K. (1983a). Control of brown spot disease of rice seedling by treatment with a group of chemicals. *Z. pflkrankh Pflscutz*, 90: 479-487.

Groth, D. E., Rush, M.C. and Lindberg, G.D. (1990). Foliar spray of fungicides for control of rice diseases in the United States. Pp.31-52 in pest management in rice. B.D. Grarson, M.B. Green and L.G. Copping, *eds. Elsevier Applied Science*. London.

Khanna, K.K. and Chandra, S. (1989). Further investigation on the control of storage rot of mango, guava & tomato fruit with homoeopathic drugs. *Indian Phytopath*., 42 (3) : 436-440.

Kumar, Mukesh and Sobita Somen (2016). Efficacy of certain botanical extracts in the management of brown leaf spot of rice caused by *Helminthosporium oryzae Bio Sciences Biotechnology Research Asia*. 13(4): 2015-2018.

Langeake, P. (1981). Alternative chemical agents for controlling plant disease. *Phil Trans. R. Soc. Lond*. B., 295: 83-101.

Naeimi, S., Okhovvat, S.M., Hedjaroude, G.A. and Khosrari, V. (2003). Sheath rot of rice in Iran. *Communication in Agricultural and Applied Biological Sciences*, 68 (4b): 681-684.

Nahid, B.H. (2007). Prevalence and control of seed born fungi of rice using fungicides and Garlic. An M.Sc Thesis, Department of plant Pathology, BAU Mymensingh.51.

Ou, S.H. (1984). Rice disease second edition. *Commonwealth Mycological Institute*, Kew, Surrey, England, 380 p.

Rahman, M.M.E. Ali, M.E. Ali, M.S., Rahman, M.M. and Islam, M.M. (2008). Hot water thermal treatment for controlling seed born microflora of maize: A review. *Hort-Flora Research Spectrum*, 1(3): 199-207.

Reddy, P. Parvatha (2013). Recent advances in Crop Protection. Publisher: Spriger India, XIX,259P.DOI 10.1007/978-81-322-0723-8.

Riazuddin, M., Rahman, H., Haque, A.H.M.M., Rashid, N.H. and Siddique, M.N.A. (2013) Ecofriendly management of seedling disease of *Rice.Bull.Inst.Trop. Agril.* Kyushu Univ. 36: 1-7.

Sanjeev Kumar (2012). Cultural Approaches for Plant Disease Management. research and reviews: *Journal of Agricultural Sciences and technology*, 1(2): 12021.

Saxena, Amar; Pandey, Margulata and Gupta, R.C. (1987). Effect of certain homoeopathic drugs o incidence of seed borne fungi and seed germination of *Abelmoschus esculentus. Indian J. Mycol. Pl. Pathology*, 17 (2): 1991-1992.

Singh, A.P., Ali, A., Asghar, S.M. and Ghufran, S.M. (1985). Assessment of yield loses due to sheath rot disease of rice. *Indian Phytopathology*, 38 (4): 753-755.

Sinha, A.K. and Sengupta, T.K. (1986). Use of unconventional chemicals in the control of blast of rice. *2nd Int. Conf. Pl. Prot. in the Tropics, Genting Highland, Malaysia*, pp. 219-221.

Schwinn, F. (1994) Seed treatment –A panacea for Plant Protection ? Seed Treatment: Progress and Prospects. BCPC. Publication. Monograph.57,3. Retrived: September 9,2014 from www.amazon.com/gp/search.

Tyagi, V. (2012). India Agriculture: Challenges for Growth and Development in present scenario. *IJPSS* 2(5): 116-128.

Wain, R.L. and Carter, G.L. (1972). Historical aspects. In "systemic fungicides" ed. R.W. Marsh, Longman, London, PP.6-33.