Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(1): 2476-2478
Received: 19-11-2017
Accepted: 20-12-2017

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Effect of a new generation low dose high efficacy herbicide pyrazosulfuron ethyl on *Rhizoctonia solani* in transplanted rice

Poornima Yadav PI and Elizabeth K Syriac

Abstract
A laboratory experiment was conducted in the Department of Plant Pathology, College of Agriculture, Kerala Agricultural University, Vellayani, Thiruvananthapuram to study the effect of the new generation sulfonyl urea herbicide, pyrazosulfuron ethyl on the major soil born rice pathogen *Rhizoctonia solani*. Six different concentrations of pyrazosulfuron ethyl (20, 30, 40, 50, 60 and 70 ppm) along with control (without herbicide) were evaluated following poisoned food technique. Results revealed that pyrazosulfuron ethyl at different concentrations except 20 ppm tested significantly inhibited the radial growth of pathogen at initial stages of inoculation i.e., one day after inoculation (1 DAI). Mycelial growth of the pathogen decreased as the concentration of the herbicide increased in the medium. Pyrazosulfuron ethyl at higher concentration i.e., 40 to 70 ppm reduced the mycelial growth of the pathogen. With the progress of time the herbicide incorporated treatments did not differ significantly. *In-vitro* effect of herbicides on sclerotia production revealed that there was significant difference at 4 DAI. Pyrazosulfuron ethyl at higher concentration i.e., 30 to 70 ppm significantly reduced the sclerotia production also showing the effectiveness of the herbicide in controlling the spread of the pathogen. This result clearly indicates the suitability of the herbicide in controlling the growth of *Rhizoctonia solani,* apart from its use as a rice herbicide.

Keywords: pyrazosulfuron ethyl, *Rhizoctonia solani,* mycelia growth, sclerotia

Introduction
Rhizoctonia solani is the most important soil borne pathogen causing the disease sheath blight in rice. This organism survives by the formation of sclerotia. Most of the herbicides applied to soil at the recommended dose will disappear in less than 12 months and so no prolonged effect is expected from herbicidal application. However in case of organisms, which develop special survival structures such as sclerotia or chlamydospores, the effect may last over 12 months. If the herbicide is favorable for its survival, this period of survival may increase for 5 to 10 years or if it is toxic to potential pathogen, their capacity to induce disease may be reduced (Altman and Campbell, 1977) [1]. With this back ground a laboratory experiment was undertaken to study the *in vitro* sensitivity of pyrazosulfuron ethyl (PSE), a new generation low dose high efficacy herbicide to major soil borne rice pathogen *Rhizoctonia solani*.

Materials and Methods
A laboratory experiment was conducted at the Department of Plant Pathology, College of Agriculture, Kerala Agricultural University, Vellayani, Thiruvananthapuram, Kerala to study the *in vitro* sensitivity of pyrazosulfuron ethyl (PSE), a new generation herbicide to major soil borne rice pathogen *Rhizoctonia solani*.

1. Isolation and Pure Culture of the Organisms
Isolate of *Rhizoctonia solani (Thanatephorus cucumeris)* causing the disease sheath blight of rice was obtained from naturally infected rice plants at the Instructional Farm, College of Agriculture, Vellayani. For the isolation of pathogen, portion of infected leaf sheath showing characteristic symptoms of the above disease was cut into small bits and surface sterilized with 0.1 percent mercuric chloride solution for one minute followed by washing in sterile water 2-3 times. The bits were then transferred aseptically to sterile petridishes containing Potato Dextrose Agar (PDA) and incubated under laboratory condition (28 ^{0} C) for twenty-four hours. The fungal growth on infected tissues was transferred to PDA slants and further purified by sub culturing.

2. Effect of pyrazosulfuron ethyl on *Rhizoctonia solani*

The test was performed following the poisoned food technique (Zentimeyer, 1955). The experiment was conducted in completely randomized design with seven treatments and four replications. Seven treatments including pyrazosulfuron ethyl at 20, 30, 40, 50, 60 and 70 ppm and a control without incorporation of chemical were included in the study.

Four replications were maintained for each concentration of the chemical. The petridishes were incubated at room temperature and radial growth of pathogen was recorded. The percentage inhibition of mycelial growth of the pathogen was calculated by the following formula:

$$I = \frac{C\text{-}T}{C} \times 100$$

Where C- colony diameter (cm) in control
T- Colony diameter (cm) in treatment
I- Percentage inhibition of growth

Results and Discussion

In general, with increase in concentration of herbicides, the growth rate of pathogen decreased. All herbicides concentrations except PSE at 20 ppm tested significantly inhibited the radial growth of pathogen at 1 DAI. PSE at 20 ppm recorded both the lowest inhibition percentage over control (8.77 %) and the highest radial diameter (5.42 cm). Maximum mycelial growth was seen in the control petridishes which was on par with 20 ppm of PSE at initial stages of inoculation. In media amended with PSE at 60 ppm, the colony growth of the test pathogen was low but statistically on par with media containing PSE at 70 ppm, 40 ppm and 50 ppm at 1 DAI.

After 48 hours of incubation, the inhibitory effect of PSE was not pronounced. The fungus obtained almost full growth covering 8.52 to 9.00 cm diameter of the petridish in the different concentration of PSE from 70 ppm to control respectively. With the progress of time, the herbicide incorporated treatments did not differ significantly from that of control with respect to mycelial growth and percentage of inhibition. Zhu *et al*. (2002) [5] reported inhibition of the mycelial growth of *R. solani* by herbicides oxyfluorfen, butachlor, acetochlor, cinmethylin and oxadiazon under *in vitro* conditions. Similarly, Harikrishnan and Yang (2001) [2] reported that pendimethalin significantly reduced the mycelial growth of *R. solani*.

Results of the study on *in vitro* effect of herbicides on sclerotia production of *R. solani* revealed that there was significant difference among treatments at 4 DAI (Fig. 1). PSE at its lowest dose tested (20 ppm) enhanced the production of sclerotia (58.50), which was on par with control (55.25). PSE at 70 ppm, the highest concentration tested, significantly reduced the number of sclerotia (19.75) produced. Lekshmanan and Nair (1980) found that simazine was most effective in preventing the formation of sclerotia followed by Tok and Saturn. Harikrishnan and Yang (2001) [2] had also obtained similar results with imazethapir and glyphosate.

Table 1: *In vitro* sensitivity of *Rhizoctonia solani* (*Thanatephorus cucumeris)* to pyrazosulfuron ethyl (PSE) on the radial growth and sclerotia production

Pyrazosulfuron ethyl (PSE) dose tested (ppm)	Growth of *Rhizoctonia solani (Thanatephorus cucumeris)*				
	Colony diameter (cm)		Per cent inhibition		Number of sclerotia (Number per petridish)
	1 DAI	2 DAI	1 DAI	2 DAI	
T_1(0 ppm)	5.97 (2.64)	9.00 (3.16)	-	-	55.25 (7.50)
T_2 (20ppm)	5.42 (2.53)	8.82 (3.13)	8.77 (17.22)	0.93 (5.53)	58.50 (7.71)
T_3 (30 ppm)	5.25 (2.49)	8.81 (3.13)	11.89 (20.17)	1.56 (7.16)	28.70 (5.45)
T_4 (40 ppm)	4.89 (2.43)	8.52 (3.09)	17.21 (24.49)	4.15 (11.75)	29.14 (5.49)
T_5 (50 ppm)	4.96 (2.44)	8.86 (3.14)	15.33 (23.04)	6.88 (15.21)	32.29 (5.77)
T_6 (60 ppm)	4.35 (2.31)	8.65 (3.11)	27.14 (31.38)	2.93 (9.86)	17.23 (4.27)
T_7 (70 ppm)	4.66 (2.38)	8.81 (3.13)	21.94 (27.93)	7.77 (16.18)	18.71 (4.44)
SEm+ CD (0.05)	0.044 0.130	- -	3.022 8.978	- -	0.269 0.792

Transformed values are given in parenthesis

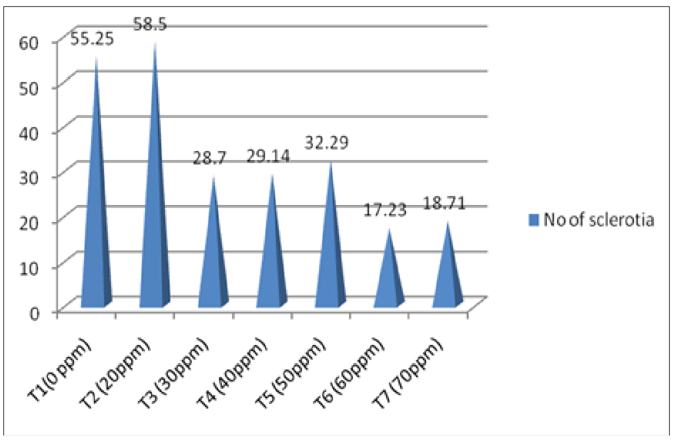

Fig 1: *In vitro* sensitivity of *Rhizoctonia solani* (*Thanatephorus cucumeris)* to pyrazosulfuron ethyl (PSE) on the sclerotia production

Conclusion

The new generation low dose high efficiency herbicide pyrazosulfuron ethyl, in addition to its potent use in weed management in rice ecosystem, has shown immense suppressive effect on the dreaded soil borne pathogen, *Rhizoctonia solani* affecting the crop. Such dual benefits can be reaped by including this chemical as one of the components in integrated pest and disease management (IPDM) programmes.

References

1. Altman J, Campbell CL. Effects of herbicides on plant diseases. Annual Review of Phytopathology. 1977; 15:361-385.
2. Harikrishnan R, Yang XB. Influence of herbicides on growth and sclerotia production in *Rhizoctonia solani*. Weed Science. 2001; 49:241-247.

3. Lekshmanan P, Nair MC. *In vitro* effects of certain herbicides on *Rhizoctonia solani*. Pesticides. 1980; 14: 30-41.
4. Zentimeyer CA. A laboratory method for soil fungicides with *Phytophthora cinnamomi* as test organisms, Phytopathology. 1955; 45:398-404.
5. Zhu H, Huang BL, Ni GH, Wu JC, Yuan SZ *et al.* Influence of some herbicides on *Rhizoctonia solani*. J Yangzhou Univ agric. Life Sci. 2002; 23:71-78.