

Effect of neem oil and its fractions against sheath blight (*Rhizoctonia solani* Kuhn) of rice

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Neem oil was separated into saturated and unsaturated fractions. In another procedure the bitter part was isolated from the oil. All these fractions along with parent oil and its stabilised formulation were evaluated against *Rhizoctonia solani*, the causal agent of sheath blight of rice in green house. The results revealed that neem oil, its saturated fraction and its stabilised formulations were effective in containing the disease incidence at 1% and latter was effective even at 0.5%. In the treatments receiving stabilised neem oil, neem oil and its saturated fraction the per cent infected tillers were the least in that order. However the data were found to be statistically insignificant.

Key words : Neem oil, *Rhizoctonia solani*, rice, sheath blight

INTRODUCTION

Extensive use of pesticides has ensured higher level of production in modern agriculture but has also posed a potential threat to the existing human ecological conditions. The researchers engaged in plant protection have, therefore, to look for biological, cultural and other ecologically safer, non-hazardous and non-polluting means to control diseases. Tewari *et al.*, (1988) and Devakumar and Parmar (1993) have emphasised the use of botanicals sources of pesticides as one of the future strategies. Several plant extracts have been demonstrated to possess excellent fungicidal properties (Sarbhoy *et al.*, 1978; Mishra and Tewari, 1990; Tewari and Nayer 1991; Ansari, 1995; Sundarraj *et al.*, 1996; Kurucheve *et al.*, 1997; Srivastava and Bihari Lal, 1997; Kandhari and Singh, 2000). Devakumar (1997) had reviewed the chemistry, biochemistry and applications of biologically active components of neem oil. Iyer *et al.* (2000) have reported anti-fungal constituents from neem oil. There is no specific report dealing with the effect of neem oil against sheath blight of rice. Keeping this in view, the present investigation was undertaken to assess the efficacy of neem (*Azadirachta indica* A Juss) oil and its fractions against *Rhizoctonia solani* causing sheath blight of rice.

MATERIALS AND METHODS

To prepare bitter fraction, neem seed kernel powder (100 g) was de-fatted with freshly distilled n-hexane by Soxhlet extraction for 8 h. The extract was removed from the left over marc. The marc was then re-extracted with freshly distilled methanol for 8 h. The methanolic extract was concentrated *in vacuo* and to the residue, ice cold n-hexane (2 × 25 ml) was added twice and the washings were decanted off. The residue left after hexane washings was subjected to high vacuum to furnish bitter fraction as a dark brown oily syrup. The bitter fraction was formulated as emulsifiable concentrate by the addition of requisite amount of cyclohexanone and Tween 80 as the emulsifier to the fraction. A 5 EC formulation was thus obtained by dissolving the bitter fraction (1.25 g) in cyclohexanone (18 ml) and Tween 80(2 ml).

Neem oil (Expeller grade) was procured commercially. The other test fractions such as stabilised neem oil 70 EC, neem oil saturated and unsaturated were prepared by the process of Devakumar (Indian Patent application pending). Emulsions for spray were obtained by appropriate dilution with tap water at the time of foliar spray. Thus 0.5 ml and 1.0 ml of any of the above formulation was diluted to 100 ml to get 0.5 % and

1.0 % spray emulsion respectively. Neem oil along with all fractions was tested *in vivo* on rice variety Pusa Basmati-1 grown in earthen pots (35 cm in size). The concentrations used were 1.0 % and 0.5 % except in bitter fraction where it was tested at 0.05 % and 0.025 %. In total, there were six treatments, three replications for each treatment and 5 plants/pot. Each pot constituted a replicate. The plain water was used as control for comparison.

Inoculations with *Rhizoctonia solani* were carried out at maximum tillering stage with colonized typha leaf bits. These bits were placed between the central region of rice plant, 5-10 cm above the water level. Twenty days after the inoculation, sheath blight per cent incidence and per cent infected tillers was assessed by Standard Evaluation System for rice (IRRI, 1980).

RESULTS AND DISCUSSION

The results revealed that neem oil along with its fraction, neem saturated and its stabilised formulation were found to be very effective in containing the disease incidence of sheath blight at 1.0 %. The stabilised neem oil was effective even at 0.5 %. Neem oil and its saturated fraction showed the disease incidence of 18.1 % and 26.2 % at 1.0 % as against 66.8 % in control. However among all the formulations tested at 0.5 %, stabilised neem oil showed the lowest disease incidence of 30.4 % as against 66.8 % in control. Less infected tillers were found in case of neem oil (4.0 %), stabilised neem (2.7 %) and saturated fraction (7.6 %) as against control (28.5 %). In the treatments receiving stabilised neem oil, neem oil and its saturated fraction the per cent infected tillers were the least in that order. However, the data were found to be statistically insignificant.

There is no specific report dealing with the effect of neem oil against sheath blight of rice in glass house or field conditions. In the present study, commercial grade neem oil could control *Rhizoctonia solani*, the causal organism of sheath blight of rice at 1.0 % concentration. The bitter oil fraction also holds promise as well and should be evaluated at higher concentration. The bitter oil fraction also holds promise as well and should be

evaluated at higher concentration Sivakumar and Sharma (2000) found neem oil very effective in inhibiting the growth and sclerotial germination *in vitro*.

Tewari and Premlatha Dath (1984) found that neem leaf extract did not favour the growth and sporulation / sclerotial production of *R. solani*. Pramanick *et al.* (1998) also found plant extract of *Azadirachta indica* very effective in inhibiting the growth of *R. solani* at 20.0 % concentration.

Neem cakes were also found to be effective against sheath blight of rice (Kannaiyan and Prasad, 1963; Padma Kumari and Balakrishnan, 1987). Incorporation of two fungal antagonists, *Gliocladium virens* and *Trichoderma longibrachiatum* and two organic soil amendments- *Glyricidia* leaf and neem cake enhanced the efficacy of their individual effect. In addition to disease suppression, the growth of the rice plant and grain yield was increased to varying degrees by different treatments (Baby and Rao, 1993).

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