

were collected 7, 10, and 15 days after inoculation (DI). Leaves from uninoculated seedlings served as control. Ethanol extracts were prepared by following the procedure described in Chandramohan et al 1967. Total phenol in the ethanol extract was estimated using Folin-ciocalteu reagent.

TNAU7124 contained more total phe, no1 than ASD5, CO 40, and TN1 (Table 1). The percentage changes in total phenol in inoculated plants compared with uninoculated plants are presented in Table 2.

Total phenolic content of the four varieties increased. but not uniformly, with inoculation. It decreased with plant age. The interactions between variety and crop stage, variety and sampling time, variety and treatment were highly significant.

Ortho-dihydroxy level increased 7 DI in TNAU7124, ASD5, and CO 40. Tillering and boot leaf stage inoculation

Table 2. Percentage changes in total phenolics and ortho-dihydroxy phenol in rice varieties due to *X. oryzae* infection. ^a

Variety	Plant stage ^b	Changes (%) in content of					
		Phenol			Ortho-dihydroxy phenol		
		7 DI	10 DI	15 DI	7 DI	10 DI	15 DI
TNAU7124	S	+23.60	+13.15	+ 4.38	+12.12	+17.80	- 4.55
	T	+ 9.87	+10.78	+10.87	+68.75	+73.58	+16.27
	B	+15.54	+12.61	+16.26	+97.30	+ 1.39	+30.43
ASD5	S	+11.11	+23.45	+ 8.22	+15.71	-16.27	- 0.48
	T	+ 1.20	+ 3.59	- 1.38	+67.80	+30.26	+16.91
	B	+ 0.76	- 0.81	- 21.37	+22.46	+44.44	+16.48
TN1	S	+ 3.16	+17.06	+12.32	-20.00	+15.48	+14.69
	T	-15.45	-14.78	+ 8.53	+11.16	+12.70	+35.65
	B	+ 2.44	+ 7.84	- 5.56	- 2.60	+21.67	+60.66
CO 40	S	+ 7.96	- 6.71	-10.04	+25.87	+ 3.27	+ 3.27
	T	+ 8.23	+ 4.42	1.55	+19.40	+ 2.04	+56.70
	B	+ 1.31	+ 5.13	+ 6.67	+ 2.67	+ 0.98	-37.76

^a DI = days after inoculation. ^b S = seedling, T = tillering, B = boot leaf.

of TNAU7124 also caused accumulation of ortho-dihydroxy phenol. During last sampling ortho-dihydroxy phenol decreased except in TN1. Interactions be-

tween variety and stage, variety and sampling time, stage and sampling time, variety and treatment, and stage and treatment were significantly superior. □

Pest management and control INSECTS

Fungal pathogens of *Nephotettix virescens* Dist. and *Nilaparvata lugens* Stål

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The potential benefits of biological insect pest control methods, especially those using bacteria and viruses, are well known. Fungi are now explored as a control method for certain insects, including green leafhopper (GLH) *Nephotettix virescens* and brown planthopper (BPH) *Nilaparvata lugens*.

GLH and BPH were found dead in unsprayed standing rice crops during cold months. Specimens from 26 locations in Tamil Nadu and Kerala States, India, were collected and examined.

Dead insects showed mummification, changes in morphological characters, and outgrowth of fungal tissues. Specimens were washed in three changes of sterile water and plated in sterile agar medium

to isolate microorganisms. Nine species of fungi were isolated from GLH and six from BPH. Five species of fungi were common to both insect species (see table).

Pathogenicity tests showed that *Fusarium* sp., isolated from GLH, and *Cephalosporium* sp., isolated from BPH, caused infection and death of both insects 4-7 days after treatment. *Fusarium* sp. caused 72.4 and 48.3% mortality of GLH nymphs and adults and 67.3 and 40.0% mortality of BPH nymphs and adults. *Cephalosporium* sp. caused GLH mortality rate of 70.7 and 37.5% and killed 75.9 and 52.7%

Fungi isolated from *N. virescens* and *N. lugens*.

Species	Common to both
<i>Aspergillus flavus</i>	*
<i>Aspergillus niger</i>	*
<i>Mucor</i> sp.	*
<i>Phoma</i> sp.	*
<i>Rhizopus</i> sp.	*
<i>Penicillium</i> sp.	
<i>Alternaria tenuis</i>	
<i>Curvularia</i> sp.	
<i>Fusarium oxysporium</i>	
<i>Cephalosporium lecanii</i>	

BPH nymphs and adults. Spraying fungal suspension containing conidia and mycelia caused higher death rates than spraying the culture filtrate or treating the insects with fungal mass.

The International Rice Research Newsletter (IRRN) invites all scientists to contribute concise summaries of significant rice research for publication. Contributions should be limited to one or two pages and no more than two short tables, figures, or photographs. Contributions are subject to editing and abridgement to meet space limitations. Authors will be identified by name, title, and research organization.