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EVALUATION OF SODIC SOIL TOLERANT RICE CULTURES AGAINST MAJOR PESTS IN TRICHY

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ABSTRACT

Four sodic soil tolerant rice cultures received from the International Rice Research Institute (IRRI), Philippines were evaluated for their host-plant resistance to brown planthopper, *Nilaparvata lugens* in screen house and leafholder, *Cnaphalocrocis medinalis* and yellow stem borer, *Scirpophaga incertulas* under field conditions. The level of antixenosis and antibiosis mechanisms found in the four cultures viz., IRRI 2011, 2028, 2030, 2122 were measured in comparison with the local check CO43. In seedling box screening test, all the cultures showed lower damage rating and nymphal settling response against the check. Further, the cultures delayed the nymphal growth (13.60 - 16.20 days) compared with CO 43 (13.0 days). Similarly, low fecundity (136.0-163.0 nos) ad shortened female adult longevity (6.0 - 9.60 days) were recorded on sodic soil tolerant cultures than CO43 (203.0 nos. and 12.4 days). Significant differences were observed among the test cultures/variety in the nymphal survival rate and their emergence. In the field, the culture IRRI 2028 was found to be highly susceptible to both pests.

KEY WORDS: *Nilaparvata lugens*, *Scirpophaga incertulas*, *Cnaphalocrocis medinalis*, Sodic soil, Tolerant cultures

Rice is attacked by various pests in India. Among them, yellow stem borer (YSB), *Scirpophaga incertulas* (Walk.) and leaffolder (LF) *Cnaphalocrocis medinalis* (G.) are very serious ones. The brown planthopper (BPH), *Nilaparvata lugens* (Stal.) has become a serious threat to rice production in many Asian countries (Dyck and Thomas, 1979). BPH is fast emerging as a serious pest of rice in Cauvery delta regions of Tamil Nadu (TN) in recent years, and the outbreak has been reported from a few places. The leaffolder and stem borer damage has been reported from many places particularly in Manikandam block of Trichy district due to the poor soil nutrient condition (Ramaraju and Natarajan, 1997 ; Ramaraju and Velusamy, 1997). In TN, rice is being cultivated under saline soil conditions with a pH range of 7.0-10.0 in about 15-20 thousand ha in Manikandam block of Trichy district. Salinity induces a number of plant responses that can alter the suitability of a plant as host for insects. Nitrogen mertabolism is affected by salinity. Synthesis of new proteins decreases while hydrolysis of storage proteins increase resulting in an accumulation of amino acids and other metabolic products (Levitt. 1980). The present study was taken up to investigate the possible resistance of YSB, LF and growth and development of BPH on selected sodic soil tolerant cultures.

MATERIALS AND METHODS

Seedbox screening test and settling responses

The experiment was conducted in greenhouse at the Agricultural College, Trichy during 1996 with five replications as per the standard evaluation system for rice. Seven days after sowing, the seedlings in each tray were thinned to 15 per row, infested with 2nd and 3rd instar nymphs at the rate of 4-5 nymphs per seedling, and covered with mylarfilm wooden cage. Nymphs that settled on rice seedlings were counted at 24 h after infestation. Seedling damage rating was done 11 days after infestation, using a 0-9 scale.

Nymphal survival

Seedlings of 10 days were planted singly in clay pots (30 cm diameter). Thirty days after planting, 10 newly hatched nymphs were confined separately in each pot and covered with mylarfilm cage (10 x 75 cm) until they became adults.

Nymphal emergence and Fecundity

At 40 days after transplanting (DAP) three pairs of males and females per plant were confined

Table 1. Damage ratings and percent of brown planthopper (BPH) nymphs that settled on seedlings of selected rice cultures

Cultures	BPH damage rating (11 days after infestation) after release	Percent of BPH nymphs that settled on seedlings at 24h
IRRI 2028	3.8 d	9.4 c
IRRI 2030	7.8 b	8.6 b
IRRI 2011	5.8 c	11.0 b
IRRI 2122	3.0 d	7.0 c
CO 43	9.0 a	13.4 a

Mean of 5 replications

In a column, means followed by the same letter are not significantly different by DMRT (P=0.05)

and the population was maintained in all cultivars. The total number of nymphs that emerged represented the viable eggs produced by the females. At the end of nymphal emergence, unhatched eggs were counted by dissecting leaf sheaths under a 20 x binocular microscope.

Nymphal duration

Ten newly hatched first-instar nymphs were introduced on 20-day-old plants in mylar film cages. Observations were made on nymphal duration until they became adults

Adult longevity

The longevity of newly emerged brachypterous females was determined on all cultivars which were infested at the rate of 10 pairs of females per pot. Survival of females was recorded daily upto 20 days after release.

Field evaluation for YSB and LF

All the cultures/variety cultivated under sodic soil with pH > 8.0 and EC > 3.0 were subjected to the attack of these pests in the field. The entries were evaluated during Kuruvai (July 1995 - Octo 1995) and Thaladi (Oct. 1995 - Jan. 1996) at Agricultural College and Research Institure, Trichy. Each culture was planted in 5 rows of 4 m each. Each was replicated five times and the test was conducted in a randomised block design. The resistant variety Ptb 33 was planted in the border rows. Leaffolder damage was assessed on 40 DAP and YSB white ear damage was recorded by counting the total number of white heads with total productive tillers on 20 days before harvest.

RESULTS AND DISCUSSION

With the modified seedling technique, the rice cultures IRRI 2122 and 2028 showed moderate resistance registering or a damage rating of 3 and 3.8. The other cultures IRRI 2011 and IRRI 2030 recorded 5.8 and 7.8 as against 9.0 in CO 43 (Table 10. In the freechoice seedbox preference test, the settling response of *N. lugens* was initially uniform but after 24 h, a significantly higher percentage of nymphs settled on CO43 (13.4) (Table 1). The nymphal survival was significantly low in IRRI 2122 (3.60 nos.) followed by IRRI 2028 (4.20) and IRRI 2011 (6.0). The variety CO43 (9.20) recorded the maximum survival followed by IRRI 2030 (6.81) (Table 2). The nymphal emergence was highest in suspectible CO43 (190 no.) as against the

Table 2. Nymphal survival, emergence, duration, female longevity and fecundity of BPH on selected rice cultures

Cultures	Survival of nymphs (no.)	Nymphal duration (days)	Fecundity (no.)	Nymphal emergence	Female longevity (days)
IRRI 2028	4.20(2.03)c	16.20(4.05)a	137.0(11.67)c	86.0(9.26)c	7.20(2.70)c
IRRI 2030	6.81(2.61)b	13.60(3.67)b	160.0(12.63)b	126.0(11.60)b	9.60(3.10)b
IRRI 2011	6.00(2.45)b	14.00(3.74)b	163.0(12.78)b	92.0(9.49)c	8.60(2.90)c
IRRI 2122	3.60(1.89)d	16.00(4.00)a	136.0(11.64)a	61.0(7.82)d	6.00(2.45)d
CO 43	9.20(3.03)a	13.00(3.61)b	203.0(14.25)d	190.0(13.78)a	12.40(3.50)a

Mean of 5 replications

In a column, means followed by the same letter are not significantly different by DMRT (P=0.05)

Figures in parentheses are square root transformed values.

Table 3. Reaction of sodic soil tolerant rice cultures against leaffolder and yellow stem borer (Mean of two season experiments)

Rice culture/ variety	Leaffolder damage rating	Stem borer white ear damage rating
IRRI 2028	7.0 a	7.0 a
IRRI 2030	7.0 a	5.6 b
IRRI 2011	3.6 c	5.0 b
IRRI 2122	3.0 c	3.0 c
PTB 33	1.0 d	1.6 d
CO 43	5.0 b	5.6 b

Mean of 5 replications

In a column, means followed by the same letter are not significantly different by DMRT (P=0.05)

noderately resistant culture IRRI 2122 (61.0) and IRRI 2028 (86.0). The average nymphal duration on moderately resistant sodic soil cultures was longer than other cultures indicating some antibiotic effect. In the sodic soil tolerant moderately resistant variety, the nymphal duration was delayed IRRI 2028 (16.20 days), IRRI 2122 (16.0) when compared with CO 43 (13.0 days). The fecundity was significantly higher on susceptible cultures CO43 (203 no.) IRRI 2011 (163), IRRI 2030 (160) as against IRRI 2028 (137). The female adult longevity was also higher in CO43 (12.40 days) as compared to shorter period in IRRI 2122 (6.0 days) (Table.2). All the sodic soil cultures was susceptible to LF and YSB except IRRI 2122. The culture IRRI 2028 was found to be highly susceptible to both pests by recording a grade of 7.0 as against 3.0 in IRRI 2122 (Table 3).

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BIOLOGICAL CONTROL OF STEM ROT OF TOMATO CAUSED BY *Sclerotium rolfsii* Sacc

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ABSTRACT

Nine antagonists were screened for the antagonistic effect against tomato stem rot pathogen. *In vitro* studies showed that the *Bacillus subtilis* and *Pseudomonas fluorescens* were highly significant in inhibiting the mycelial growth and sclerotial production of the pathogen. Next to these two antagonists, *Trichoderma harzianum* and *T. viride* were effective in reducing the sclerotial size and germinatin. Pot culture studies indicated that the soil amendment with *T. harzianum* resulted in better plant stand upto 80 per cent at 60 DAS followed by *T. viride* and *P. fluorescens*.

KEY WORDS : Tomato, Stem rot, *S. rolfsii*. Biological control

The stem rot disease of tomato caused by *Sclerotium rolfsii* Sacc. is distributed in tropical and subtropical regions of the world and is common in India, Southern United States, Central America, Africa, Australia and the countries surrounding the mediterranean. In addition to tomato, the pathogen causes sévere damage to green bean, lima bean, onion, pepper, potato, watermelon, Southern Pea and Sweet potato (Aycock, 1966). The management strategies using chemicals have been reported so far. But the chemicals pose environmental problems in addition to escalating cost. Hence, an experiment was carried out to manage the disease with biocontrol agents since these agents are cheap and also very effective for the management of soil borne diseases (Cook and Baker, 1983).