

BIOCHEMICAL DIFFERENCES IN THE RICE VARIETIES SUSCEPTIBLE AND RESISTANT TO RICE TUNGRO VIRUS

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ABSTRACT

Biochemical analyses of selected rice cultures/varieties resistant, moderately resistant and susceptible to rice tungro virus (RTV) disease revealed significant differences. The contents of total soluble sugar, reducing sugar and non-reducing sugar were higher in susceptible varieties. Resistant cultures/ varieties had higher amount of total phenols and ortho dihydric phenols.

Key Words : *Rice tungro virus*

INTRODUCTION

Rice tungro virus (RTV) disease is one of the most widespread and destructive rice virus diseases in south and southeast Asia (Hibino et al., 1988). The most efficient vector species is the rice green leafhopper, *Nephotettix virescens* (Distant). Tungro is one of the major factors limiting rice production. It occurs in epidemic form and spreads very quickly over a large area sometimes causing yield losses even upto 100 per cent (Rao and Anjaneyulu, 1980). Among the rice varieties grown in Tamil Nadu some of them IR 50, IR 64 and ASD 14 were relatively resistant to RTV, while varieties like ponni, white ponni and MDU 3 were moderately resistant. However the popular varieties, CO 37, CO 43 and ADT 36 were highly susceptible to RTV. Some of the new cultures and a variety IR 72 were found to be resistant to RTV on artificial

inoculation. Analysing the biochemical composition of the known resistant and susceptible varieties may be helpful in identifying resistant genotypes to RTV.

MATERIALS AND METHODS

Extraction of plant tissues in alcohol

One gram of fresh cut pieces of leaves were immediately plunged into 10ml of boiling 80 per cent ethanol for five to 10 minutes. After cooling the tissues were crushed in a pestle and mortar. The ground tissues were passed through two layered cheese cloth and then reextracted with two to three ml of boiling 80 per cent ethanol for 3 minutes so as to ensure complete removal of alcohol soluble substances. Both extracts were mixed and filtered through whatman No.41 filter paper and the volume was made up to 10 ml with 80 per cent ethanol. This ethanol extract

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was used for all the biochemical estimation (Mahadevan and Sridhar, 1986).

Total soluble sugars were estimated by anthrone method (Dubois et al., 1951). Reducing sugars were estimated by the Nelson's method (Nelson, 1944). The quantity of non-reducing sugars was calculated by deducting the reducing sugar content from the total sugars present in the hydrolysed sample. Total phenols of the leaf sample were estimated by Folin-ciocalteu method (Bray and Thorpe, 1954). Ortho dihydric phenols were estimated by Arnow's method (Arnow, 1937).

RESULTS AND DISCUSSION

Total soluble sugars

The total soluble sugar content was significantly higher in susceptible varieties than the resistant and moderately resistant cultures/varieties. Rice variety T(N)1 had the highest amount of (12.150 mg/g) total soluble sugars and it was significantly different from all other cultures/varieties. Among the resistant cultures/varieties, the culture IR 33043-46-1-3 contained the least amount of (6.375 mg/g) total soluble sugars (Table-1).

Reducing sugars

The reducing sugar content was significantly higher in all susceptible varieties than the resistant and moderately resistant cultures/ varieties. The highly susceptible variety T(N)1 had the maximum amount (5.621 mg/g) of reducing sugars. The resistant culture TNAU 831521 contained the minimum amount of (2.220 mg/g) reducing sugars (Table -1).

Non-reducing sugars

The non-reducing sugar content of susceptible varieties was more than the resistant and moderately resistant cultures/varieties. The highly susceptible T(N)1 recorded the highest amount of (6.538 mg/g) non-reducing sugars. The resistant culture IR 33043-46-1-3 had the least amount (4.045 mg/g) of non-reducing sugars (Table.1).

Total phenols

Resistant cultures/varieties had increased amount of total phenols compared to susceptible varieties (Table -2). The phenolic content of highly susceptible T(N)1 variety was 1.144 mg/g while the resistant culture IR 33043-46-1-3 had 1.579 mg/g.

Ortho dihydric phenols

The ortho dihydric (OD) phenol content was significantly more in the resistant cultures/varieties than the susceptible varieties (Table-2). The resistant cultures TNAU 831521, IR 39357-91-3-2-3, IR 37865-29-3-1-3, IR 72 and IR 32429-148-1-3-3 had the highest amount of OD phenols, while OD phenol content was least in highly susceptible varieties CO 37 and T (N)1.

Phenols as secondary plant substances confer protection against pathogens (Mahadevan, 1974). The rate of accumulation of phenols was more in resistant accessions than in susceptible accessions (Mahadevan, 1966; Vidhya sekaran, 1978; Sathianathan and Vidhyasekaran, 1981; Sidhan and Jaglan, 1987; Borthakur and Addy, 1983). Eraivan Arutkani Aiyathan (1987)

Table 1. Total soluble sugar, reducing sugar and non-reducing sugar contents in selected rice cultures/varieties.

Sl. No.	Culture/variety	Reaction to RTV	Sugars (mg/g of fresh leaves)*		
			Total soluble sugar@	Reducing sugar@	Non-reducing sugar@
1.	IR 72	R	6.435 ab	2.302 b	4.134 b
2.	IR 33043-346-1-3	R	6.375 a	2.330 c	4.045 a
3.	IR 50404-57-2-2-3	R	7.202 e	2.885 f	4.317 cf
4.	IR 52431-60-1-2-1	R	7.552 f	3.217 j	4.335 fg
5.	IR 34686-56-2-2-2	R	7.850 g	3.127 h	4.724 h
6.	CRM 25	R	6.705 c	2.490 d	4.125 cd
7.	TNAU LFR 842718	R	7.504 f	3.353 k	4.150 bc
8.	AS 33773	R	8.149 h	3.398 l	4.750 h
9.	IR 32429-148-1-3-3	R	7.550 f	3.247 j	4.304 ef
10.	IR 37865-29-3-1-3	R	7.202 e	2.982 g	4.220 cd
11.	IR 39357-91-3-2-3	R	7.564 f	3.342 k	4.222 cd
12.	TNAU 831520	R	8.640 i	3.455 m	5.185 i
13.	TNAU 831521	R	6.475 b	2.220 a	4.255 de
14.	IR 50	R	8.827 j	3.667 n	5.160 i
15.	IR 64	R	6.405 a	2.235 a	4.170 bc
16.	ASD 17	R	7.028 d	2.627 e	4.402 g
17.	MDU 3	MR	9.449 k	3.972 o	5.477 k
18.	Ponni	MR	8.825 j	3.647 n	4.179 i
19.	White ponni	MR	8.775 j	3.457 m	5.318 j
20.	IR 20	S	10.375 m	4.315 q	6.060 m
21.	ADT 38	S	10.007 l	4.197 p	5.810 l
22.	CO 37	HS	10.379 m	4.217 p	6.162 n
23.	CO 43	HS	10.054 l	4.542 r	5.512 k
24.	ADT 36	HS	11.825 n	5.307 s	6.519 o
25.	T(N)I	HS	12.150 o	5.621 t	6.538 o

* Mean of three replication.

Mean of the values assessed in 20 DAS and 40 DAS.

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

Table 2. Total Phenol and ortho dihydric phenol contents in selected rice cultures / varieties

Sl. No.	Culture/variety	Reaction to RTV	Phenols (mg/g of rfresh leaves)*	
			Total phenols@	OD phenols@
1.	IR 72	R	1.569 mn	1.130 k
2.	IR 33043-46-1-3	R	1.579 n	1.099 j
3.	IR 50404-57-2-2-3	R	1.454 j	1.013 i
4.	IR 52431-60-1-2-1	R	1.453 j	1.025 i
5.	IR 34686-56-2-2-2	R	1.406 hi	1.024 i
6.	CRM 25	R	1.446 j	0.997 h
7.	TNAU LFR 842718	R	1.414 i	0.998 h
8.	AS 33773	R	1.422 i	0.925 g
9.	IR 32429-148-1-3-3	R	1.537 l	1.125 k
10.	IR 37865-29-3-1-3	R	1.549 lm	1.130 k
11.	IR 39357-91-3-2-3	R	1.575 n	1.137 k
12.	TNAU 831520	R	1.388 h	0.925 g
13.	TNAU 831521	R	1.534 l	1.140 k
14.	IR 50	R	1.319 fg	0.917 fg
15.	IR 64	R	1.577 n	1.097 j
16.	ASD 17	R	1.478 k	1.087 j
17.	MDU 3	MR	1.322 g	0.884 e
18.	Ponni	MR	1.295 f	0.884 e
19.	White Ponni	MR	1.310 fg	0.905 f
20.	IR 20	S	1.218 c	0.799 c
21.	ADT 38	S	1.258 e	0.880 c
22.	CO 37	HS	1.173 b	0.745 a
23.	CO 43	HS	1.252 de	0.832 d
24.	ADT 36	HS	1.234 cd	0.782 b
25.	T(N)I	HS	1.144 a	0.737 n

*Mean of three replication.

Mean of the values assessed in 20 DAS and 40 DAS.

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

earlier reported that the RTV resistant culture TNAU 831520 had higher total phenol content than the moderately resistant and susceptible varieties. Viswanathan and Kalode (1981) found that the total phenol content of GLH resistant varieties was relatively higher than that of the susceptible T(N).

Ortho dihydric phenols are often considered to play a major role in disease resistance and disease development (Johnson and Schaal, 1957; Easwaran,

1971). The resistant varieties had more amount of OD phenols than the susceptible varieties (Sathyanathan and Vidhyasekaran, 1981; Sidhan and Jaglan, 1987). In the present study also some of the cultures and the variety IR 72 are found to be similar to the already known resistant variety like IR 50 in their biochemical composition and they can be selected as resistant material for further use.

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