

Effect of Silica on Tolerance of Floating Rice to Yellow Stem Borer (*Scirpophaga incertulas* Walker)

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ABSTRACT

Effects of silica in floating rice tissues on the penetration of yellow stem borer (*Scirpophaga incertulas* Walker) and on tolerance of the floating rice variety Leb Mue Nang 111 were studied. Seeding of LMN 111 were cultured in nutrient solution with concentrations of sodium silicate of 0, 5, 10, 25, 50, and 100 ppm of silica. Ten first instar larvae of yellow stem borer were confined on each rice stem in order to examine for the numbers of larvae and time of penetrating into rice stems. Crude silica in rice plant tissues were analysed.

Increased silica level in floating rice tissues significantly reduced the number of larvae penetration and increased time for the larvae penetrating. Rice plants with high level of silica in tissues were more tolerated to the infestation of stem borer.

The role of silica in resistance to rice stem borer has been investigated by many scientists for other rice types. High silica content in rice stem and susceptibility to rice borer (Djamin and Pathak, 1967) and varieties differed in silica level. However, the effects of silica on resistance or tolerance to stem borer in floating rice are not known.

The purpose of this study was to examine the effect of silica on the penetration of yellow stem borer (*Scirpophaga incertulas* Walker) in floating rice and on tolerance of the rice variety Leb Mue Nang. The aim was to provide basic knowledge for using silica content in floating rice plants as a factor in screening for resistance or tolerance to stem borer.

MATERIALS AND METHODS

Seedling of LMN 111 were cultured in nutrient solution (Yoshida et al., 1976) for 14 days. Seedlings were transplanted into individual pots with concentrations

of sodium silicate in the culture solution of 0, 5, 10, 25, 50 and 100 ppm of silica. The experiments were carried out using a randomized complete block design with 14 replicates. Ten first instar larvae of yellow stem borer confined in two small parafin membrane bags were placed on one stem of each rice plant when plants were 75 days old. Timing of penetration into stem of each larva was recorded. Rice plants were checked for deadheart symptoms and survival after 15-30 days of larvae infestation. The rice plants from each treatment were analysed for percent of crude silica by using the method of Yoshida et al. (1976) after 75 days old.

RESULTS AND DISCUSSION

Increased silica level in floating rice tissues significantly affected the feeding behaviour of yellow stem borer, reducing the number penetrating, and increasing time for the larvae penetration (Table 1).

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Table 1. Effect of silica on the prenatration of yellow stem borer larvae

Silica concentration (ppm)	No. induced larvae	No. Prenetrated larvae	% Larvae prenatration	Time of prenatration	% Crude silica in rice tissues
0	93	59	63.44	37.20	0.73
5	114	62	54.39	50.25	1.80
10	133	82	61.65	49.61	2.65
25	133	87	65.41	53.36	2.99
50	128	50	39.06	77.66	4.27
100	139	18	12.95	128.78	7.01

A highly significant negative correlation between silica contents in plant tissues and percent of larvae prenatration was ($y = 76.7 - 8.4x$, $r = 0.91^*$, Fig. 1).

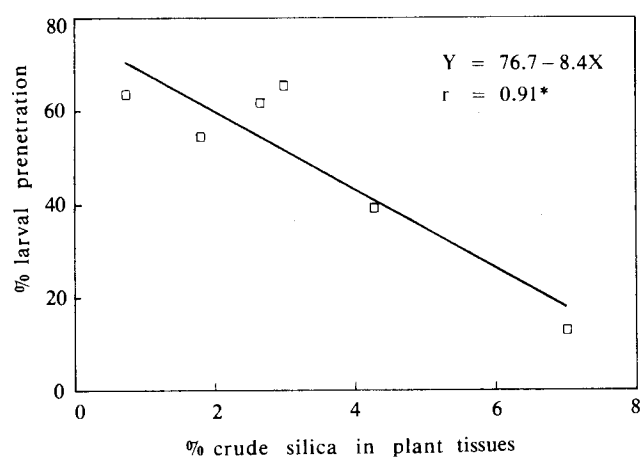


Fig. 1. Percent crude silica in plant tissues related to percent of larval prenatration.

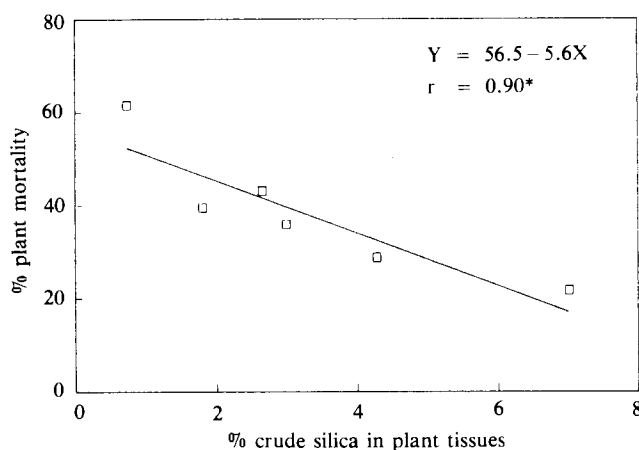


Fig. 3. Effect of percent crude silica in plant tissues on plant mortality.

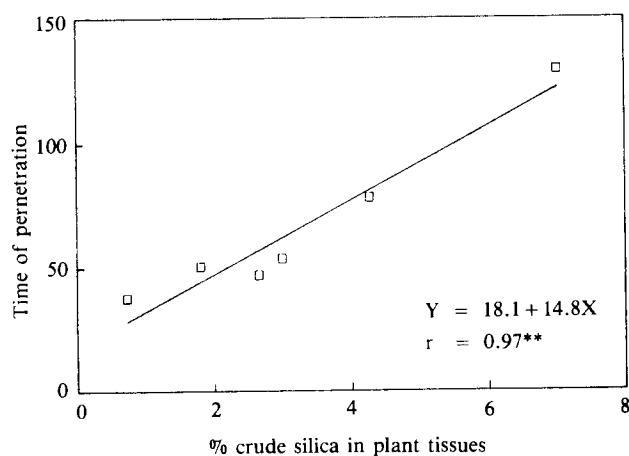


Fig. 2. Percent crude silica in plant tissues related to Time of prenatration of YSB larval.

Time taken for larvae to bore into the rice stem was significantly increased by the silica content in rice plant ($y = 18.11 + 14.8x$, $r = 0.97^{**}$, Fig. 2). Furthermore, rice plants which had high content of silica were more tolerance to the infestation of stem borer ($y = 56.5 - 5.6x$, $r = 0.90^*$, Fig. 3). Most of the larvae failed to prenatrate into stem tissues and died on the stem surfaces. Mortality of plants cultured in 100 ppm silica was approximately one third of the check with rice plants cultured in solutions without silica (Table 2).

Table 2. Effect of silica on the tolerance of rice plant to the prenatration of yellow stem borer.

Silica concentration (ppm)	No. of infested plant	% Plant mortality	% Plant stunt	% Healthy plant	Plant height (mean) (cm)
0	14	61.53	30.76	7.70	35.25
5	14	39.29	15.38	45.34	53.05
10	14	42.86	0.00	57.14	55.72
25	14	35.71	14.28	50.01	54.75
50	14	28.57	14.28	57.15	46.08
100	14	21.43	78.57	0.00	20.60

One factors which may be useful in selecting floating rice for tolerance to stem borer could be the percent of silica in the rice tissues. To relate the silica levels in differences varieties of deepwater and floating rice to their tolerance to stem borer should be the further studies.

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