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SOME OBSERVATIONS ON PHYSIOLOGY AND GENETICS OF
BRONZING DISEASE IN RICE

BY

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ABSTRACT

Bronzing is a physiological disease caused by ferrous ion (Fe^{++}) toxicity and anaerobic conditions in the soil. Occurrence of this disease has been frequently reported from the wet zone low country of Sri Lanka.

Bronzing can be induced in liquid culture grown plants using excess Fe^{++} and low pH values in the culture medium. Disease resistant and disease susceptible varieties could be distinguished when grown in a medium with 425 ppm Fe^{++} at pH 5.0. The varieties H9, BG11-11, BG90-2, LD125 and IR8 are susceptible to the disease and the varieties H4, Kuantik Putih, IR2061-464-2-4-4-6, IR2070-189-4-1-3 and Mashuri are resistant to the disease. Experiments using varying levels of Fe^{++} and hydrogen sulphide (H_2S) in the culture medium, showed that H_2S can enhance the rate of bronzing development in susceptible varieties.

Fresh leaf sections showed accumulation of minute reddish brown globules in chlorophyllous tissue of diseased leaves. The oily

nature of these globules was confirmed as had been previously reported. Leaf lipids were analysed by gas-liquid chromatography. Using four rice varieties H9, BG11-11, BG90-2 and IR2061-214-2-7-6-3, the content of fatty acids was found to be more in diseased condition. Furthermore, arachidic acid (C-20) was found only in the diseased leaf samples.

A remarkable difference of rates of respiration of roots was observed between bronzing resistant and susceptible varieties. However, no influence of Fe^{++} toxicity on root respiration could be detected.

Six reciprocal genetic crosses were made between susceptible varieties H9 and BG11-11 and resistant varieties H4, Mashuri, Kuantik Putih and IR2061-464-2-4-4-6. The parental plants, F_1 , F_2 and F_3 generations were screened for bronzing resistance using liquid culture conditions. It appeared that the resistance to bronzing is a dominant character and has no maternal influence. The increased resistance observed in hybrid plants and their subsequent generations, indicated a strong heterotic effect in all the crosses conducted. Polygenic nature of the resistance to bronzing was assumed and was confirmed from the results obtained from backcrosses.

The heritability of the resistance to bronzing was high or moderately high in most of the genetic crosses. Study of correlation between grade of bronzing and other metric characters namely, plant height, number of tillers per plant, leaf length, leaf breadth, diameter of stem, angle of leaf with stem, panicle length, panicle weight, grain length, grain width, grain thickness, grain weight, harvest and straw weight did not help to establish a definite relationship between resistance to bronzing and any other metric characters tested.

<u>CONTENTS</u>	<u>PAGE</u>
 <u>CHAPTER ONE - INTRODUCTION</u>	
1.1	1 - 2
1.2	3 - 10
1.3	10 - 13
1.4	13 - 16
 <u>CHAPTER TWO - PHYSIOLOGY OF BRONZING</u>	
<u>2.1 Introduction</u>	17 - 21
<u>2.2 Materials and Methods</u>	22 - 34
2.2.1 Rice varieties	22
2.2.2 Containers	22 - 24
2.2.3 Chemicals and media	24 - 27
2.2.3.1 Sach's liquid culture medium	27
2.2.4 Growth of rice plants in liquid culture medium	28 - 29
2.2.5 Quantitative estimation of bronzing	29 - 31
2.2.6 Preparation of hydrogen sulphide solution	31 - 32
2.2.7 Preparation of methyl esters of fatty acids of leaf lipids for the analysis by gas-liquid chromatography	32 - 33
2.2.8 Operating parameters for gas-liquid chromatography	34

<u>2.3 Results</u>	35 - 85
2.3.1 The development of bronzing symptoms under liquid culture conditions	35 - 52
2.3.2 The effects of anaerobic conditions on bronzing	52 - 67
2.3.3 The analyses of fatty acids in bronzed leaves	68 - 81
2.3.4 Respiratory rates of roots of the plants affected by bronzing	81 - 86
<u>2.4 Discussion</u>	87 - 94
2.4.1	87 - 88
2.4.2	88 - 91
2.4.3	91 - 92
2.4.4	93 - 95
 <u>CHAPTER THREE - GENETICS OF BRONZING</u>	
<u>3.1 Introduction</u>	96 - 97
<u>3.2 Materials and Methods</u>	98 - 111
3.2.1 Parental rice varieties	98
3.2.2 Containers	98 - 100
3.2.3 Chemicals and media	100 -
3.2.3.1 Application of fertilizers	102 -

3.2.4	Growth of rice plants in the artificial paddy field	102 - 106
3.2.5	Cross-fertilization between resistant and susceptible varieties for the studies of genetic aspect	106 - 108
3.2.6	Definition of metric characters and the methods of measurement	108 - 111
<u>3.3</u>	<u>Results</u>	112 - 140
3.3.1.1	Crosses between bronzing resistant and bronzing susceptible varieties	112 - 123
3.3.1.2		123 - 133
3.3.2	Heritability studies of resistance to bronzing	133 - 136
3.3.3	Correlation between grade of bronzing and other metric characters	136 - 140
<u>3.4</u>	<u>Discussion</u>	141 - 147
3.4.1		141 -
3.4.2		141 - 145
3.4.3		145 - 146
3.4.4		147 - 148
<u>APPENDIX</u>		149 - 175
<u>REFERENCES</u>		176 - 181