

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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B17A 27

GENETIC IMPROVEMENT IN RICE FOR RESISTANCE TO SOME DISEASES USING GAMMA RAYS AND MOLECULAR TECHNIQUES

By

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B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Cairo Univ., 2002

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THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

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In

**Agricultural Sciences
(Genetics)**

Department of Genetics
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Cairo University
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Handwritten signature: G. Ashour
Date: 17/5/17
Official stamp: Faculty of Agriculture, Cairo University, with fields for 'صدر' (Issued) and 'تاريخ' (Date).



APPROVAL SHEET

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Date: 3 / 7 / 2017

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Name of Candidate: Ibrahim Osamy Ibrahim Hassan **Degree:** Ph.D.
Title of Thesis: Genetic Improvement in Rice for Resistance to Some
Diseases Using Gamma Rays and Molecular Techniques
Supervisors: Dr. Mohamed Hassanin Soliman
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ABSTRACT

Rice diseases are one of the major limiting factors of rice production worldwide specially, blast (*Magnaporthe grisea*) and bakanae or foot rot (*Fusarium moniliforme*) diseases. Therefore, this study was conducted to improve rice for resistance to blast and bakanae diseases as well as yield and yield related traits using gamma rays and Simple Sequence Repeats (SSR) technique. Where grains of three local rice cultivars Giza 177, Sakha 101 and Sakha 104 were irradiated with different doses of gamma rays (0, 150, 200, 250 and 300 Gy). Eleven rice mutants were selected and evaluated for resistance to blast and bakanae diseases under natural and artificial infection conditions in M₃ and M₄ generations. Molecular screening and genetic diversity of resistance (R) genes to blast and bakanae diseases were performed for the selected mutants and its parents using 22 SSR and 3 specific markers.

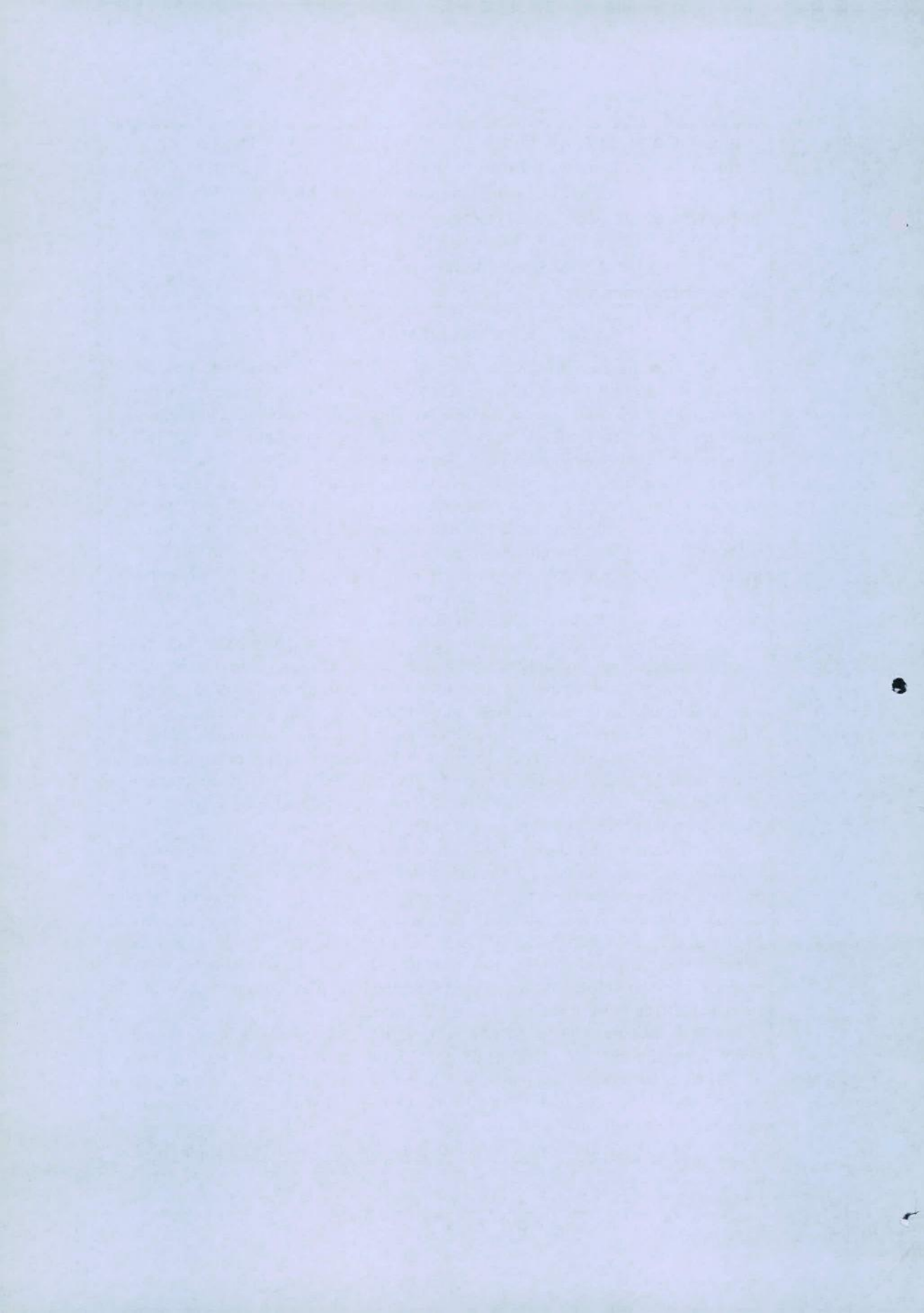
Results of both natural and artificial infection showed that out of the eleven selected mutants only nine mutants were resistant; four mutants were highly resistant to blast and bakanae diseases at seedling and adult stages under natural infection in permanent field and artificial infection in greenhouse while, five mutants were resistant to blast disease and susceptible to bakanae disease.

Results of SSR analysis revealed that all markers produced a total of 72 alleles with 13 unique bands. The genetic similarity between 11 rice mutants and its parents ranged from 5% between mutant SK4151 and Sakha 101 to 73% between mutant SK4201 and its parent Sakha 104.

Molecular screening of R genes to blast showed that blast resistant mutants have a combination of some partial resistance genes, *Pi40(t)*, *Pi20(t)*, *Pi35(t)*; and complete resistance genes (*Pib*, *Pik*, *Pik-h*, *Pita*, *Piz*) that confer durable resistance to all blast races. In contrast, the susceptible mutants showed high susceptibility to the most of tested blast races because it were not possess genes *Pik-s*, *Pik-h* and *Pi9* that linked to RM144, RM224 and RM541 markers, respectively. Therefore, these R genes seemed to play a significant role in resistance to the most of tested races of blast disease.

For bakanae disease, RM9, a specific marker for bakanae resistance, showed one unique band (180 bp) for SK115 mutant that resistant only to isolate 10. Whereas each of the mutants SK4152, SK4154 and SK120 were discriminated by one band (161, 161 and 136 bp, respectively) that were a highly resistant to both bakanae isolates 10 and 20.

Key words: Rice, gamma rays, mutation, blast, bakanae, resistance genes, SSR.



DEDICATION

I dedicate this work to whom my heartfelt thanks to my Father, my Mother, my Wife and my Children Mohamed and Arwa for their patience, helping and encouragement, as well as my Sisters and my Brothers for their encouragement and hearted support.

