UNIVERSITI PUTRA MALAYSIA

EFFECTS OF PRIMING AND STORAGE ON SEED QUALITY OF ADAN RICE

HENRITA SAMUEL

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EFFECTS OF PRIMING AND STORAGE ON SEED QUALITY OF ADAN RICE

By

HENRITA SAMUEL

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

July 2020

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DEDICATION

Dedicate to my families and friends.

Thank you for everything.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

EFFECTS OF PRIMING AND STORAGE ON SEED QUALITY OF ADAN RICE.

By

HENRITA SAMUEL

July 2020

Chairman : Noorasmah binti Saupi, PhD
Faculty : Agricultural Science and Forestry (Bintulu Campus)

Adan rice is a traditional rice planted by the indigenous people in Borneo, especially Bario, Ba'kelalan, Long Semadoh (Malaysia) and Krayan, Indonesia. It is a very important crop among the indigenous people as a source of economic income and recently as agritourism product. However, the production of Adan rice is low due to the limited technology and knowledge applied in the agronomic practices particularly in the quality of planting materials used. Therefore, this study aims to determine the priming methods in enhancement of seed quality and seed storage that can increase the production and yield. Adan rice has fine seed with small size, low surface area (27.04±1.10 mm^2) and aspect ratio (24.83%). The seed of Adan rice was of high quality with high purity (99.77%), favorable moisture content (10.54%) and high germination rate (91.3%). Hydropriming in 35°C within 12 hours and thermopriming 45°C in 12 hours was optimal for Adan rice seeds. Ambient temperature storage has a significantly higher in germination rate (95%) compared to 86% and 79% as for refrigerator and freezer, respectively. Seed enhancement using hydropriming and keeping them in ambient temperature are recommended for short period seed storage. However, improvement in storage method for Adan rice should be further studied for a longer storage period.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KESAN RAWATAN 'PRIMING' DAN PENYIMPANAN TERHADAP KUALITI BERAS ADAN.

Oleh

HENRITA SAMUEL

Julai 2020

Pengerusi : Noorasmah binti Saupi, PhD
Fakulti : Sains Pertanian dan Perhutanan (Kampus Bintulu)

Padi Adan adalah padi tradisional yang ditanam oleh penduduk asli di Borneo, terutamanya di Bario, Ba'kelalan. Long Semadoh (Malaysia) dan Krayan, Indonesia. Ia merupakan tanaman yang sangat penting di kalangan orang asli sebagai sumber pendapatan ekonomi dan pada masa kini ia merupakan salah satu produk agro-perlancongan. Walau bagaimanapun, pengeluaran beras Adan adalah rendah kerana teknologi dan pengetahuan yang terhad yang digunakan di dalam amalan agronomi terutamanya di dalam penggunaan bahan tanaman yang berkualiti. Oleh itu, kajian ini bertujuan untuk menentukan kaedah priming dalam meningkatkan kualiti benih dan penyimpanan benih yang dapat meningkatkan pengeluaran dan hasil. Padi Adan mempunyai biji benih yang halus dengan ukuran kecil, luas permukaan rendah (27.04 ± 1.10 mm^2) dan nisbah aspek (24.83%). Biji benih padi Adan berkualiti tinggi dengan kemurnian tinggi (99.77%), kandungan kelembapan yang baik (10.54%) dan kadar percambahan yang tinggi (91.3%). Hidroprim pada suhu 35 ° C dalam tempoh 12 jam dan termopriming 45 ° C dalam 12 jam adalah optimum untuk biji benih padi Adan. Penyimpanan pada suhu persekitaran mempunyai kadar percambahan yang lebih tinggi (95%) berbanding 86% dan 79% untuk peti sejuk dan penyejuk beku. Peningkatan benih menggunakan hidropriming dan menyimpannya dalam suhu persekitaran adalah disarankan untuk penyimpanan dalam jangka pendek. Walaubagaimanapun, peningkatan kaedah penyimpanan beras Adan harus dikaji lebih lanjut untuk jangka masa penyimpanan yang lebih lama

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I certify that a Thesis Examination Committee has met on 21 July 2020 to conduct the final examination of Henrita Samuel on her thesis entitled "Effects of Priming and Storage on Seed Quality of Adan Rice" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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I hereby confirm that:

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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LIST OF ABBREVIATIONS

AOSA	Association of Official Seed Analysts
ASA	Acetyl salicylic acid
Cl-	Chlorine
GMD	Geometric mean dimension
GP	Germination percentage
GR	Germination rate
HDPE	High-density polyethylene
ISTA	International seed testing association
Ra	Aspect ratio
RCBD	Randomized completely blocked design
Sa	Surface area

CHAPTER 1

INTRODUCTION

Rice is consumed as a staple food in Asian countries. It is a very important crop because of its role as a main caloric supply for this region. Malaysian rice self-sufficiency level is at 65%. The production of rice is currently met the sufficiency level but the sustainability was uncertain due to the growing population. It is important to maintain the sufficiency by increasing the production in line with the increasing of population in the country. Hence, increase in rice productivity should come from the same acreage designated as for rice production.

Superior planting material is important in rice cultivation. The crop is solely grown using seeds. Therefore, production and maintenance of high quality seed is very important in rice. An adequate, vigorous and uniform stand from quality rice seeds is necessary for economic production. Good seed with proper seed treatment and maintenance will give superior seed gemination and this will ensure good seedling growth and reduce disease infection.

Adan rice is a traditional rice planted by the indigenous people in Borneo, especially in Bario, Ba'kelalan, Long Semadoh (Malaysia) and Krayan (Indonesia). It is well known to the local people for its soft texture, fine and elongated grains, mild aromas and splendid taste. There is limited scientific report on this traditional rice but from the in-situ site visit and information from local farmer, this rice is reported to be planted once annually. The growth and maturation period of this variety is 170-175 days. The straw will be left to rot in the field after harvest as a natural nutrient source for nitrogen in the next planting. Adan rice is cultivated in irrigated field. Seeds are sowed and raised in nursery and the seedlings are transplanted into field 30 days after sowing. Because of its traditional status, this variety is preferred by the local people in spite being sold at higher price. The demand for this traditional exotic rice is increasing. Therefore, it is a very important agriculture crop among the indigenous people as a source of economic income and now its role as agritourism product is well known to other region beside Borneo. Attempts are made to introduce this Adan rice in the national and international markets in spite of the low supply of the product due to the use of traditional technology in its cultivation. Currently, there is very limited technology applied in the agronomic practices of Adan.

Rice cultivation due to low literacy among the farmers and coupled with limited research done on this rice variety regarding its production potential. The main objectives of this study were:

i. to determine the quality and physical characteristics of Adan rice seed,
ii. to determine the effects of hydropriming, thermopriming and NaCl priming technique of Adan rice seed germination,
iii. to determine the effects of storage technique on primed Adan rice seeds.

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