



UNIVERSITI PUTRA MALAYSIA

**GRAIN FILLING IMPROVEMENT OF RICE BY FOLIAR FERTILIZER
APPLICATION UNDER LIMITED WATER SUPPLY**

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FACULTY OF AGRICULTURE

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**GRAINFILLING IMPROVEMENT OF RICE BY FOLIAR FERTILIZER
APPLICATION UNDER LIMITED WATER SUPPLY**

BY

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science

FACULTY OF AGRICULTURE

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CERTIFICATION

This project report entitled “Grain Filling Improvement of Rice by Foliar Fertilizer Application Under Limited Water Supply” is prepared by Nur Fateha Binti Isahak and submitted to Faculty of Agriculture in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of Bachelor of Agriculture Science.

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LIST OF ABBREVIATIONS

ANOVA	:	Analysis of Variance
et. Al	:	and others
RCBD	:	Randomize Complete Block Design
DAS	:	Days After Sowing
CWS	:	Cyclic Water Stress
g	:	gram

ABSTRACT

Environmental stress factors such as limited water occur all over the world including in Malaysia. Generally, grain filling will reduce when limited water supply or drought was imposed during reproductive stages of rice cultivation throughout over the world. An experiment was conducted to select the best foliar fertilizer that can increase grain filling of rice under limited water supply. The variety of rice cultivated was MR219 by using pot. There were 36 totals of pots with three hills of paddy plant per pot. Six treatments were applied to the paddy; normal flooding, cyclic water stress for six days, cyclic water stress for six days + spermine, cyclic water stress for six days + silica, cyclic water stress for six days + brassinolide, and cyclic water stress for six days + multiple-compound fertilizer mixed with humic acid. Each treatment had six replications. Growth parameters were taken in range five to ten days after the treatment was applied. In yield attributes, the filled grain per hill, thousand grain weight, and etc was taken after harvesting. The experiment was conducted at Rice Research Centre, Greenhouse B at Ladang 10, UPM Serdang, Selangor. The treatments were laid out in a Randomize Complete Block Design (RCBD) and data obtained were analyzed using analysis of variance (ANOVA) with The Statistical Analysis System (SAS) software. The objective of this experiment was to find the best foliar fertilizer that can improve grain filling and yield of rice under limited water supply. All foliar fertilizer that has been applied to paddy plant showed positive impact on grain filling of paddy plant. The best foliar fertilizer that can be applied by farmers to overcome drought or water stress condition was spermine (2.06 ton ha⁻¹).

ABSTRAK

Faktor tekanan alam sekitar seperti kekurangan air telah berlaku di seluruh dunia termasuk di Malaysia. Secara umumnya, pengisian bijian akan berkurangan apabila bekalan air terhad atau kemarau terjadi semasa peringkat pengisian bijirin pada pokok padi di seluruh pelusuk dunia. Satu eksperimen telah dijalankan untuk memilih baja foliar yang terbaik yang boleh meningkatkan pengisian bijirin padi dalam keadaan bekalan air yang terhad. Varieti padi yang ditanam adalah MR219 dengan menggunakan baldi. Terdapat 36 jumlah baldi dengan tiga rumpun padi pada setiap baldi. Enam rawatan telah dijalankan ke atas pokok padi; paras air biasa, kitaran tekanan air selama enam hari, kitaran tekanan air selama enam hari + spermine, kitaran tekanan air selama enam hari + silika, kitaran tekanan air selama enam hari + brassinolide, dan kitaran tekanan air selama enam hari + campuran baja berganda-sebatian dengan asid humik. Setiap rawatan mempunyai enam replikasi. Parameter pertumbuhan pokok diambil dalam tempoh 5-10 hari selepas rawatan diaplikasikan ke pokok. Parameter hasil; pengisian biji setiap baldi, berat seribu biji, dan lain-lain diambil selepas penuaian. Eksperimen ini dijalankan di Pusat Penyelidikan Padi, Rumah Hijau B di Ladang 10, UPM Serdang, Selangor. Eksperimen ini dijalankan dengan menggunakan Rekabentuk Blok Rawak Lengkap dan data yang diperolehi dianalisis dengan menggunakan analisis varians (ANOVA) bersama perisian Sistem Analisis Statistik (SAS). Objektif eksperimen ini adalah untuk mencari baja foliar terbaik yang boleh meningkatkan pengisian bijirin dan hasil beras ketika bekalan air terhad. Semua baja foliar yang digunakan dalam eksperimen ini menunjukkan kesan positif terhadap pengisian biji pada pokok padi. Baja foliar terbaik yang boleh digunakan oleh petani untuk mengatasi kemarau atau tekanan air adalah spermine (2.06 tan ha⁻¹).

CHAPTER 1

INTRODUCTION

Rice belongs to Graminae family and become a staple food for large part of human population, especially in Asia. It is also known as second-highest worldwide grain production after corn.

According to Alias (2002) MR219 is the commercial Malaysian Indica rice and the first rice variety to be introduced and developed by the Malaysian Agricultural Research and Development Institute (MARDI) based on direct seeding planting. Variety MR219 was chosen as plant material that has the shortest period of maturity compared to the other rice variety. It only needs five months from day after sowing until harvesting (105-110 days after sowing).

Furthermore, MR219 also resistance to blast and bacterial leaf blight and have strong and tall culms (Alias,2002). It is also has high number of grains that lead to high yielding and producing more than 10 mt/ha. The number of grains per panicle differs from rice varieties previously released by MARDI which is 200 grains/panicle and it can achieve grain weight as high as 28-30 mg (Alias,2002).

On top of everything else, other characteristics of MR219 rice variety are increase in plant height and leaf emergence at regular interval and also have active tillering and it occurs gradually. The panicle initiation for this rice variety will occurs before maximum tiller number is reached, in a very short season.

According to Krishnan and Dayanandan(2003), the meaning of grain filling in rice can be defined as the formation of filial tissues of rice caryopsis from the endosperm and embrayo are isolated from the maternal tissues with the absence of

any symplastic continuity. The ovular vascular trace located at central side of the ovary will transport nutrients to the endosperm and also the solute will enter through chalaza into the nucellar projection and then into the endosperm. To improve yield and grain quality in rice, one should master basic knowledge about the path of assimilate transport and storage, and the development of embryo and endosperm.

Improvement grain-filling by the stimulation of source activity and translocation of carbohydrates is important for japonica-dominant varieties, and the improvement of sink production efficiency would result in the increase of the yield potential in the indica-dominant varieties. (Yoshinaga et al., 2013).

Drought is a major limiting factor affecting rice yield and productivity all over the world, including Malaysia. As we all know, water is an important agricultural resource and plants need water to survive and do their cellular activities so that they can complete their life cycle.

In case of paddy plants, they are planted in the field that is a flooded parcel of arable land for semiaquatic rice. So, they need enough water to complete their life cycle. The water supply will influence the yield and growth of the paddy. To encounter this problem, farmers can apply other alternatives such as application of foliar fertilizer to improve the growth and grain filling of the rice plant.

Hence the objective of this study was to find the best foliar fertilizer that can help to improve grain filling of paddy plants under limited water supply.

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