

RICE PRODUCTION UNDER DIFFERENT WATER INPUT

By

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**Thesis Submitted to the School of Graduate Studies, Universiti Putra
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May 2004

**DEDICATED
TO
MY BELOVED PARENTS
AND BROTHER**

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

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“More crops per drop” concept is a growing interest in rice cultivation. An experiment was carried out to determine the effect of reducing water on rice production and to investigate the temporal changes in chemical properties in soil solution. There were five treatments simulating different flooding depths and durations during the rice growing period namely, W1: continuous flooding at 5 cm, W2: continuous flooding at 1 cm, W3: continuous flooding at 5 cm for the first 3 weeks followed by 1 cm thereafter, W4: continuous flooding at 5 cm for the first 6 weeks followed by 1 cm thereafter, and W5: continuous flooding at 5 cm for the first 9 weeks followed by 1 cm thereafter. Soil pH and redox potential were taken at 4 cm depth, and the concentrations of N, P, K, Ca, Mg, Zn, Cu, Fe, and Mn in soil solution were measured at weekly intervals. At harvest, the number of tillers and panicles were counted. Grain yield, number of grains per panicle and weight of 1000 seeds were determined. In addition, the weight of straw was also obtained. The effect of irrigation treatments was not significant for tiller number, panicle number, grain yield (t/ha), straw weight (t/ha), grain/panicle, and 1000 seeds weight (g). The tiller numbers and panicle numbers were in the range of 6745000 to

6956000, and 6367000 to 6651000 per ha, respectively. Grain yield of rice under continuous 5 cm flooding was not significantly different from the other treatments. Dry filled grain yield (12 % moisture content) was found to range from 11.72 to 12.39 t/ha. The weight of 1000 seeds was 27.2 to 27.8 g. The different flooding levels had no significant effect on the nutrients concentration analyzed in soil solution at weekly intervals. However, in general, there was an increase in the concentrations of N, Zn, Cu, Fe, and Mn in the soil solution during the first few weeks of flooding, then the values remained relatively stable until harvest, while P concentration remained constant through out the growing period in all treatments. The concentration of K, Ca, and Mg declined with time for all treatments. Redox potential value was significantly lower in treatments that were under 5 cm flooding water compared to 1 cm flooding water, and it showed values that were more negative. Soil pH was in the range of 5.4 to 6.6 in all treatments. Overall, this study showed that yield and yield components, nutrient concentration, and soil pH were not affected by different water treatments but redox potential was significantly different.

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

PENGHASILAN PADI DENGAN PENGGUNAAN INPUT AIR YANG BERBEZA

Oleh

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Konsep “Lebih tanaman bagi setiap titisan air” ialah kaedah penanaman padi yang dihasratkan. Kajian ini dijalankan bagi menentukan kesan pengurangan air terhadap pengeluaran hasil padi dan mengkaji sifat-sifat kimia tanah. Terdapat lima rawatan dengan kedalaman air dan tempoh masa yang berbeza di sepanjang tempoh penanaman padi iaitu, W1: pemberian air berterusan sedalam 5 cm, W2: pemberian air berterusan sedalam 1 cm, W3: pemberian air berterusan sedalam 5 cm untuk 3 minggu pertama selepas itu dikurangkan kepada 1 cm, W4: pemberian air berterusan sedalam 5 cm untuk 6 minggu pertama selepas itu dikurangkan kepada 1 cm dan, W5: pemberian air berterusan sedalam 5 cm untuk 9 minggu pertama selepas itu dikurangkan kepada 1 cm. pH tanah dan potensi redoks pada kedalaman 4 cm dan kepekatan N, P, K, Ca, Mg, Zn, Cu, Fe dan Mn di dalam larutan tanah diambil setiap minggu. Setelah dituai, bilangan anak padi dan bilangan tangkai dikira. Hasil bijirin, bilangan bijirin per tangkai dan berat 1000 biji padi ditentukan. Selain daripada ini, berat jerami juga ditentukan. Didapati, kesan rawatan pengairan tidak bererti terhadap bilangan anak padi, bilangan tangkai, hasil bijirin (t/ha), jerami (t/ha), bijirin/tangkai, dan berat 1000 biji

padi (g). Bilangan anak padi dan bilangan tangkai masing-masing adalah antara 6745000 hingga 6956000, dan 6367000 hingga 6651000 sehektar. Hasil padi dengan pemberian air berterusan sedalam 5 cm tidak menunjukkan perbezaan bererti dengan lain-lain rawatan. Hasil bijirin penuh kering (12% kandungan kelembapan) adalah antara 11.72 hingga 12.39 t/ha. Berat 1000 biji padi adalah antara 27.2 hingga 27.8 g. Perbezaan kedalaman air tidak memberi kesan bererti terhadap kepadatan nutrient pada setiap minggu. Walau bagaimanapun, pada keseluruhannya terdapat peningkatan pada kepekatan N, Zn, Cu, Fe, dan Mn di dalam larutan tanah dalam tempoh beberapa minggu pertama pemberian air dan kemudian nilai ini dikekalkan sehingga penuaian, manakala nilai P tidak berubah disepanjang tempoh penanaman terhadap semua rawatan. Kepekatan K, Ca, dan Mg didapati berkurang dengan masa pada paras air yang berbeza. Potensi redoks menunjukkan perbezaan yang bererti dengan rawatan pemberian air sedalam 5 cm iaitu lebih negatif berbanding dengan pemberian air sedalam 1 cm. pH tanah didapati kurang berasid iaitu antara 5.4 hingga 6.6 dalam semua rawatan. Pada keseluruhannya, tiada perbezaan bererti diantara rawatan kedalaman air yang berbeza dengan hasil padi, komponen hasil, kepekatan nutrient dan pH tanah. Walau bagaimanapun, rawatan ini memberi kesan bererti terhadap potensi redoks.

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I certify that an Examination Committee met on **21 May 2004** to conduct the final examination of **Md. Sarwar Jahan** on his **Master of Science** thesis entitled "Rice Production Under Different Water Input" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

Signature

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