



UNIVERSITI PUTRA MALAYSIA

***CRITICAL WEED PERIOD IN AEROBIC RICE AND
WEED CONTROL USING CHEMICALS***

JAYA SURIA A/P ARUL SEBASTIAN MICHEAL

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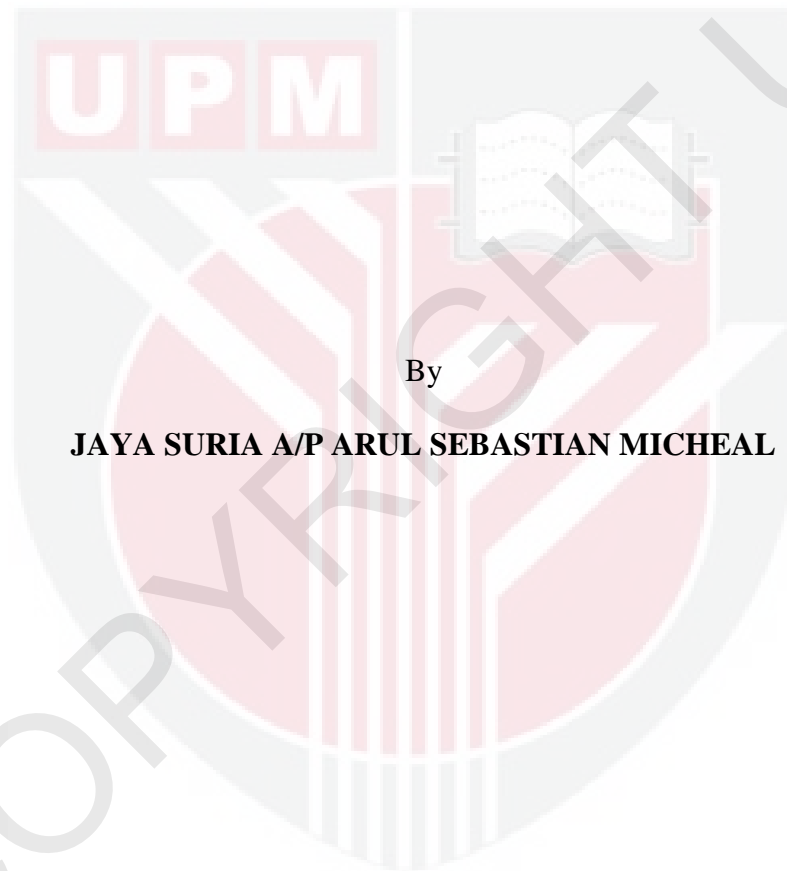


JAYA SURIA A/P ARUL SEBASTIAN MICHEAL

**MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA**

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**CRITICAL WEED PERIOD IN AEROBIC RICE AND WEED CONTROL
USING CHEMICALS**



By

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**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

CRITICAL WEED PERIOD IN AEROBIC RICE AND WEED CONTROL USING CHEMICALS

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JAYA SURIA A/P ARUL SEBASTIAN MICHEAL

May 2012

Chair: Associate Professor Abdul Shukor bin Juraimi, PhD

Faculty: Agriculture

Aerobic rice system is the most promising irrigation water saving technology, but is highly impeded by severe weed pressure. Weed control using same herbicide causes development of herbicide resistant weed biotypes and posing serious problem in weed management. This study was conducted to determine the most efficient selective rice herbicides under aerobic culture system while also considering the economics of the chemical weed control method through determination of critical period for weed control (CPWC). Two CPWC experiments were conducted from November 2007 to March 2008 at the Malaysian Agricultural Research and Development Institute, Seberang Perai, Penang, Malaysia. The study was realized by investigating the durations of weed interference and weed-free period which respectively determines beginning and end of CPWC. Results showed that by using a local aromatic rice variety, MRQ74 in aerobic rice cultivation, its rice yield would be severely impaired if weeds were not removed from 17 to 53 days after sowing (DAS). An acceptable yield loss at 5% could be gained if weeds were controlled from 11 DAS until harvest at 74 DAS. Meanwhile, CPWC study on an aerobic rice nursery line, AERON001 had significant competitions from 13 to 75 DAS for a 5%

acceptable yield loss, and from 29 to 40 DAS for a 10% acceptable yield loss. The screenings of selective rice herbicides were conducted during off season (April – July 2008) and main season (November 2008 – February 2009) to evaluate fourteen and eight herbicide treatments, respectively. Weed free control and weedy check treatments were also included in both trials. The trial used a randomized complete block design with three replications in the off season, and four replications in the main season. Twenty five weed species were found in the aerobic rice field but two species (*Eleusine indica* and *Digitaria ascendens*) seemed to be dominant. Based on the weed control efficiency, weed index values, and net benefit economic analysis, it was shown that the herbicide combinations of Propanil/Thiobencarb (1.2 kg ai ha⁻¹/2.4 kg ai ha⁻¹) followed by Bentazone/MCPA (0.6 kg ai ha⁻¹/0.1 kg ai ha⁻¹) or Cyhalofop-butyl + Bensulfuron (0.1 kg ai ha⁻¹ + 0.06 kg ai ha⁻¹) followed by Bentazone/MCPA (0.6 kg ai ha⁻¹/0.1 kg ai ha⁻¹) or Pendimethalin (1.0 kg ai ha⁻¹) followed by Cyhalofop-butyl + Bensulfuron (0.1 kg ai ha⁻¹ + 0.06 kg ai ha⁻¹) followed by Bentazone/MCPA (0.6 kg ai ha⁻¹/0.1 kg ai ha⁻¹) or Pretilachlor + Pendimethalin (0.375 kg ai ha⁻¹/0.75 kg ai ha⁻¹) followed by Bentazone/MCPA (0.6 kg ai ha⁻¹/0.1 kg ai ha⁻¹) could be the possible alternative for effective and economic weed control in rice under aerobic system. Based on these results and CPWC, the abovementioned selective rice herbicides should be applied at or before 11 DAS followed by sequential application by latest 43 DAS to maximize aerobic rice yield and minimize weed biomass.

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

**TEMPOH KRITIKAL RUMPAI DALAM PADI AEROBIK DAN
PENGAWALAN RUMPAI MENGGUNAKAN RACUN KIMIA**

Oleh

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Sistem padi aerobik merupakan satu teknologi yang menjimatkan penggunaan air, tetapi amat terdedah kepada masalah tekanan rumpai. Penggunaan racun rumpai yang sama berulang kali menyebabkan kewujudan biotaip rumpai yang rintang racun dan menimbulkan masalah dalam pengurusan rumpai. Kajian ini telah dijalankan untuk menentukan racun rumpai selektif yang efisien untuk sistem kultur padi aerobik serta mempertimbangkan pengurusan rumpai secara kimia yang ekonomik menerusi penentuan tempoh kritikal pengawalan rumpai (CPWC). Dua eksperimen penentuan CPWC telah dijalankan dari bulan November 2007 sehingga Mac 2008 di Institut Penyelidikan dan Pembangunan Pertanian Malaysia, Seberang Perai, Pulau Pinang, Malaysia. Kajian dilaksanakan melalui penentuan tempoh persaingan rumpai dan tanpa persaingan yang masing-masing menentukan permulaan dan pengakhiran CPWC. Keputusan menunjukkan dengan penggunaan varieti padi wangi tempatan MRQ74 dalam pertanian padi aerobik, hasil padi didapati merosot sekiranya rumpai tidak dikawal dari 17 sehingga 53 hari selepas tanam (HST). Pengurangan 5% hasil padi boleh diperoleh sekiranya rumpai dikawal dari 11 HST sehingga 74 HST. Manakala, kajian CPWC pada jalur semaian padi aerobik, AERON001 mengalami persaingan yang signifikan dari 13 sehingga 75 HST untuk pengurangan 5% hasil

padi, dan 29 sehingga 40 HST bagi pengurangan 10% hasil padi yang diterima. Penyaringan racun selektif telah dijalankan ketika luar musim (April – Julai 2008) dan musim utama (November 2008 – Februari 2009) bagi mengkaji masing-masing empat belas dan lapan rawatan racun rumpai. Rawatan bebas rumpai dan dengan rumpai juga diambilkira dalam kedua-dua kajian. Kajian ini menggunakan rekabentuk blok rawak lengkap dengan tiga replikasi ketika luar musim, dan empat replikasi ketika musim utama. Sebanyak dua puluh lima jenis spesies rumpai dikenalpasti dalam tapak padi aerobik dengan dua spesies (*Eleusine indica* dan *Digitaria adscendens*) muncul sebagai dominan. Berdasarkan efikasi kawalan rumpai, nilai indeks rumpai, dan keuntungan bersih analisa ekonomi, didapati kombinasi racun rumpai Propanil/Thiobencarb ($1.2 \text{ kg ai ha}^{-1}/2.4 \text{ kg ai ha}^{-1}$) diikuti oleh Bentazone/MCPA ($0.6 \text{ kg ai ha}^{-1}/0.1 \text{ kg ai ha}^{-1}$) atau Cyhalofop-butyl + Bensulfuron ($0.1 \text{ kg ai ha}^{-1} + 0.06 \text{ kg ai ha}^{-1}$) diikuti oleh Bentazone/MCPA ($0.6 \text{ kg ai ha}^{-1}/0.1 \text{ kg ai ha}^{-1}$) atau Pendimethalin ($1.0 \text{ kg ai ha}^{-1}$) diikuti oleh Cyhalofop-butyl + Bensulfuron ($0.1 \text{ kg ai ha}^{-1} + 0.06 \text{ kg ai ha}^{-1}$) diikuti oleh Bentazone/MCPA ($0.6 \text{ kg ai ha}^{-1}/0.1 \text{ kg ai ha}^{-1}$) atau Pretilachlor + Pendimethalin ($0.375 \text{ kg ai ha}^{-1}/0.75 \text{ kg ai ha}^{-1}$) diikuti oleh Bentazone/MCPA ($0.6 \text{ kg ai ha}^{-1}/0.1 \text{ kg ai ha}^{-1}$) berkemungkinan menjadi alternatif bagi kawalan rumpai yang efektif dan ekonomik dalam sistem padi aerobik. Berdasarkan keputusan ini dan CPWC, racun-racun selektif padi di atas harus disembur pada atau sebelum 11 HST diikuti oleh aplikasi berturutan selewat-lewatnya 43 HST untuk memaksimumkan hasil padi aerobik dan meminimalkan biojisim rumpai.

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I certify that a Thesis Examination Committee has met on the 17th of May 2012 to conduct the final examination of Jaya Suria a/p Arul Sebastian Micheal on her thesis entitled “Determination of Critical Weed Period in Aerobic Rice and Control of Weeds using Chemicals” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science degree.

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DECLARATION

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

JAYA SURIA A/P ARUL SEBASTIAN MICHEAL

Date: 17 May 2012

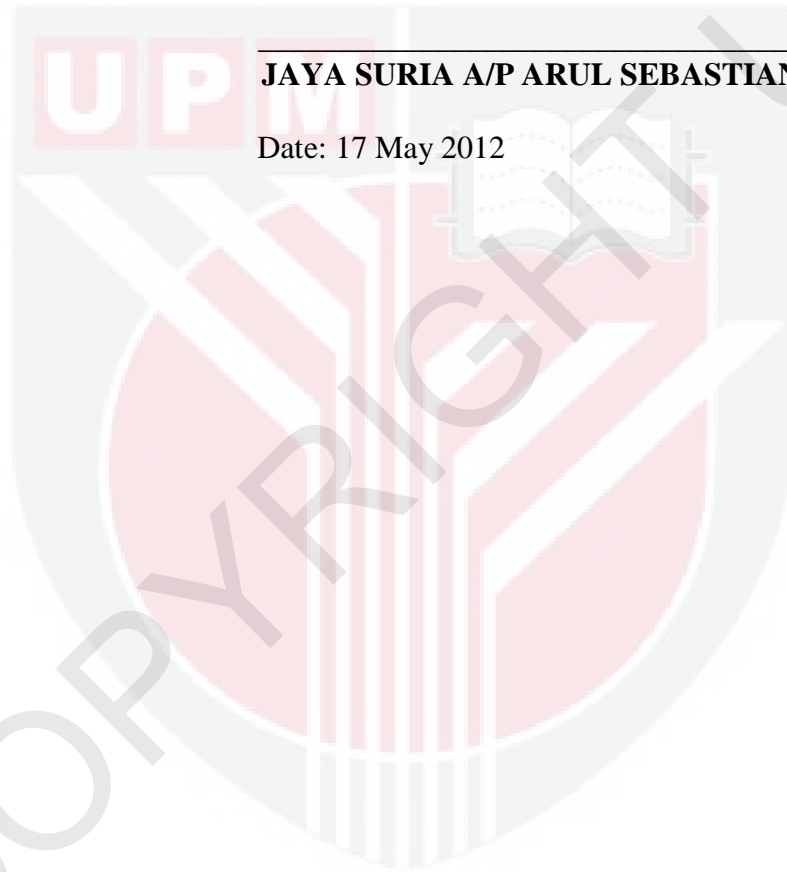


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