



**UNIVERSITI PUTRA MALAYSIA**

**WATER SPINACH (*Ipomoea reptans*) NUTRIENT LEACHING AND  
WATER LOSS IN THREE IRRIGATION SYSTEMS**

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WATER SPINACH (*Ipomoea reptans*) NUTRIENT LEACHING AND  
WATER LOSS IN THREE IRRIGATION SYSTEMS

By

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A project report submitted to Faculty of Agriculture, University Putra Malaysia, in  
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## CERTIFICATION FORM

This project report entitle “ Water Spinach (*Ipomoea reptans*) Nutrient Leaching And Water Loss In Three Irrigation Systems ” is prepared by Akmal Hafiz Bin Jaafar and submitted to Faculty of Agriculture in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture Science.

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## ABSTRACT

Rb 900 tube also known as root trainer is a new way to replacing polybag that use with BX-1 media. Rb 900 tube and BX-1 media is still new in Malaysia, there is no scientific test has been done on these Rb 900 and BX-1 systems. The advantages if compare with polybag are, root growth is more vigorous and rapidly. The plant survival is better than polybag. Root trainer also reduce the space requirements in the nursery and transport costs to the field but most interesting is plants grown in root trainer systems are often ready for planting out when they are substantially smaller than those from conventional polybag. The objective of this experiment was to make a comparison between each of the irrigation which is the most suitable in term of nutrient leaching. This experiment was conducted at Field No. 15, Universiti Putra Malaysia under the rain shelter for 5 weeks in July 2014. The experimental layout was the Randomised Complete Block Design (RCBD). The treatments were the three irrigation system: overhead sprinkler (T1), drip irrigation (T2) and capillary wick system (T3) with 3 replications per treatment. Consequently, the experimental units or plots were 9. Each plot was planted with 10 water spinach plants, so the total seedling planting for this experiment was 90 plants. Result from the study showed that capillary wick system produced least leachate in volume and nutrients loss. The mean cumulative for volume of was 292.60 ml and for the nutrients N, P, K, Ca, Mg - 201.80 N mg L<sup>-1</sup>, 152.06 P mg L<sup>-1</sup>, 264.00 K mg L<sup>-1</sup>, 17.698 Ca mg L<sup>-1</sup>, 24.99 Mg mg L<sup>-1</sup>. Thus, capillary wick system was the most effective irrigation suggested to be used with BX-1 and Rb 900.

## ABSTRAK

Rb 900 tiub yang dikenali sebagai “root trainer” adalah cara baru untuk menggantikan polibeg yang digunakan dengan BX-1 media. Rb 900 tiub dan BX-1 media masih baru di Malaysia, tidak ada ujian saintifik yang dilakukan ke atas Rb 900 dan BX-1 sistem. Kelebihan jika dibandingkan dengan polibeg adalah, pertumbuhan akar yang lebih kuat dan pantas. Kelangsungan hidup tumbuhan adalah lebih baik daripada polibeg. “Root trainer” juga mengurangkan keperluan ruang di tapak semaian dan pengangkutan kos ke ladang, tetapi yang paling menarik ialah tumbuhan yang ditanam dalam “root trainer” sistem bersedia untuk penanaman apabila tumbuhan keseluruhannya adalah lebih kecil daripada tumbuhan polibeg konvensional. Objektif eksperimen ini adalah untuk membuat perbandingan antara setiap pengairan yang paling sesuai dari segi nutrien larut lesap. Eksperimen ini telah dijalankan di Ladang No. 15, Universiti Putra Malaysia di bawah rumah lindungan hujan selama 5 minggu pada bulan Julai 2014. Susun atur eksperimen adalah Randomised Complete Block Design (RCBD). Rawatan yang digunakan ialah tiga sistem pengairan: overhead sprinkler (T1), pengairan titisan (T2) dan sistem capillary wick (T3) dengan 3 ulangan bagi setiap rawatan. Oleh itu, unit eksperimen atau plot adalah 9. Setiap plot telah ditanam dengan 10 kangkung maka jumlah penanaman anak benih di dalam ujikaji ini adalah 90 pokok. Keputusan kajian menunjukkan bahawa sistem capillary wick menghasilkan larut resap yang paling kurang dari segi jumlah isipadu air dan nutrien. Min terkumpul bagi sistem capillary wick dalam isipadu air larut resap adalah 292.60 ml dan N, P, K, Ca, Mg nutrient - 201.80 N mg L<sup>-1</sup>, 152.06 P mg L<sup>-1</sup>, 264.00 K mg L<sup>-1</sup>, 17.698 Ca mg L<sup>-1</sup>, 24.99 Mg

mg L<sup>-1</sup>. Dengan itu, sistem capillary wick adalah pengairan yang paling berkesan yang disyorkan untuk digunakan untuk BX-1 dan Rb 900.



## 1.0 INTRODUCTION

### 1.1 Justification of the study

Efficient use of water is a key factor in irrigation management especially in mass production. Water scarcity and climate change has cause direct impact to our agriculture. Management of water will become an importance issue for the future. Many efforts are being made to increase the productivity in handling water resources and a way in choosing the best irrigation system for plant to get optimum yields and growth.

Malaysia is a tropical region where the annual rainfall in Peninsular Malaysia is approximately 2,420 mm while Sabah's average rainfall is 2,630 mm and Sarawak's is approximately 3,850 mm (Zahid *et al.*, 2014). Focusing on Peninsular Malaysia the climate is influenced by the Southwest monsoon, from May to August, and the Northeast monsoon, from November until February. As the result of abundant of rain, most soil nutrients are leached out which make soil deficiency in nutrient. Problem also occurs in the Southwest monsoon where it is the driest period for the peninsula. Normally it affects the northern area but somehow it get worst and unpredicted throughout the year. This causes water rationing which effect the productivity in agricultural.

Plants are provided with required water by irrigation in a way that the plant gets optimum yields and growth even the best quality production. With the help of proper irrigation systems this problem can be overcome.

Many research on the area of potting medium to plants, have shown an improvements in adaptation of potting system. The normal conventional media container used for seedling planting is polythene bag (polybag). It is no longer an only option to plant a seed. Rb 900 tube also known as root trainer is a new way to replacing polybag introduces by Humibox Company that use with media BX-1. The introduction of BX-1 and RB 900 bring a lot of benefits such as; improvement of root growth, lightweight and compact design, reduce labour work and it is eco-friendly as the container can be reused. In contrast, the old conventional polybag causes problem such as polluting environment as the polybag is left at the site and take longer time to disintegrate. Others include space consuming and heavy.

## 1.2 Problem Statement

No scientific research has been done to test the effectiveness of Rb 900 and BX-1 media in term of leaching amount and water uptake.

## 1.3 Aim and objectives of study

### 1.3.1 Aim

The aim of the study was to investigate the best three irrigation systems for the use in Rb-900 tube.



### 1.3.2 Objective

The objectives of this study are consequently as below:

1. To analyse the physical and chemical characteristics of the BX-1 media.
2. To analyse nutrients leaching losses such as N, P, K, Ca and Mg in the three irrigation systems.
3. To measure water losses in the three watering systems.

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