UNIVERSITI PUTRA MALAYSIA

RAINFASTNESS OF GLYPHOSATE AS AFFECTED BY SURFACTANTS ON *Paspalum conjugatum* P.J Bergius

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Thesis submitted to the Faculty of Agriculture in fulfillment to the requirement for the Degree of Bachelor Science Agriculture Science

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CERTIFICATION

Thesis entitled Rainfastness of glyphosate as affected by surfactants on *Paspalum conjugatum* P.J Bergius by Izat Ezatte Binti Musa submitted to the Faculty of Agriculture in fulfillment of course PRT4999 for the requirement of Degree of Bachelor Agricultural Science.

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LIST OF UNITS

%	=	Percentage
m	=	Meter
cm	=	Centimeter
ml	=	Mililiter
L	=	Liter
g	=	Gram
Kg	=	Kilogram
a.i	=	Active ingredient
Ha	=	Hectare
L/Ha	=	Litre per Hectare
Kg/Ha	=	Kilogram per Hectare
Kg a.i/ ha	=	Kilogram active ingredients per Hectar
w/w	=	Weight/weight
Ppm	=	Part per million
m/min	=	Meterper minute
mm/ hour	=	Millimeter per hour
M	=	Molar

LIST OF ABBREVIATIONS

LV	=	Low volume
ULV	=	Ultra-low volume
NPK	=	Nitreogen, Phosporus, Potassium
CF	=	Flow coefficient
ANOVA	=	Analysis of variance
NAoH	=	Sodium hydroxide
DAT	=	Day after treatment

ABSTRACT

Weeds are major pest on crop plantation in Malaysia, especially in rubber and oil palm plantations. In Malaysia, *Paspalum conjugatum* is most commonly found in plantations. *Paspalum conjugatum*, a perennial or annual weed species from family of Poaceae is distinct among many invasive plant species because ~~of~~ it strongly stoloniferous characteristic and easy to spread out. In order to overcome the problem of *P. conjugatum*, glyphosate is used to control the growth of *Paspalum conjugatum*. Glyphosate is one of the broad-spectrum systemic herbicide that can be used to control this weed. The efficacy of glyphosate can be improved by adding surfactant in the spray solution. Nevertheless, rainfastness is one of the important factors affecting the efficacy of foliar applied herbicides. Rainfall that occurs after application will have significant effect on the residual activity and efficacy of herbicides. The research was conducted to determine the influence of surfactants on rainfastness of glyphosate on *Paspalum conjugatum*. The experiment was conducted in Field 2, UPM Serdang. Treatments used were Glyphosate + 0.025% Silwet408, Glyphosate + 0.14% Bond Adjuvant, Glyphosate + 0.05% Miracle S240, Glyphosate + 0.1% KaO A-134, Glyphosate alone and control. The spraying was conducted on eight week after transplanting followed by exposure to rainfall using rainfall stimulator for 1 and 3 hours after spraying. There were 6 treatments with 5 replications for each treatment. Results showed significant different between before and after rain on spray deposition, chlorophyll content and necrosis. No significant different was observed after exposure to rain 1 and 3 h after application. Glyphosate + 0.14% Bond Adjuvant produced a better performance on spray deposition, chlorophyll content and necrosis compared with other surfactants.

ABSTRAK

Rumpai merupakan pemusnah yang utama didalam tanaman perladangan di Malaysia, terutama sekali di kawasan perladangan getah dan juga kelapa sawit. Di Malaysia, rumpai *Paspalum conjugatum* adalah yang paling biasa boleh di jumpai didalam kedua-dua tanaman perladangan ini. *Paspalum conjugatum* adalah sejenis tumbuhan daripada kumpulan Poaceae adalah berbeza daripada kalangan spesis tumbuhan invansif kerana memiliki keupayaan akar stolon yang menjalar dan senang untuk disebarkan.Untuk menangani masalah *P. conjugatum* ini, glyphosate digunakan untuk mengawal pertumbuhan *Paspalum conjugatum*. Glyphosate adalah salah satu racun rumpai spektrum luas yang boleh digunakan untuk mengawal rumpai ini. Keberkesanan glyphosate boleh di tingkatkan dengan penambahan bahan kimia surfaktan dalam larutan semburan. Namun, hujan adalah faktor penting yang mempergaruhi keberkesanan racun foliar yang digunakan, Hujan yang berlaku selepas aplikasi semburan memberi kesan terhadap sisa aktiviti dan keberkesanan racun herba.Kajian ini telah dijalankan untuk mengenal pasti pengaruh surfaktan terhadap racun glyphosate dan hujan ke atas *Paspalum conjugatum*. Kajian ini dilakukan di Ladang 2, UPM Serdang. Rawatannya adalah Glyphosate + 0.025% Silwet408, Glyphosate + 0.14% Bond Adjuvant, Glyphosate + 0.05% Miracle S240, Glyphosate + 0.1% KaO A-134, Glyphosate dan satu sebagai kawalan. Semburan di lakukan pada minggu ke-8 selepas penanaman di ikuti dengan pendedahan hujan mengunakan simulasi hujan tiruan untuk 1 jam dan 3 jam selepas rawatan. Terdapat 6 jenis rawatan dengan 5 replikasi bagi setiap rawatan. Keputusan telah menunjukkan terdapat perbezaan ketara antara sebelum dan selepas hujan ke atas pembendapan semburan

kandungan klorofil, dan nekrosis. Tiada perbezaan ketara yang telah di perhatikan terhadap pendedahan ke atas hujan 1 jam dan 3 jam selepas aplikasi.

1.0 INTRODUCTION

1.1 Background of study

Weed is considered as an unwanted plant that threat and interfere the biodiversity in protected or unprotected area (Williams and West, 2000; Weber, 2003; Groves et al., 2005; Pickering and Hill, 2007; Pysek and Richardson, 2010; Williams et al., 2010; Vil a et al., 2011; Stohlgren et al., 2013). Weeds become a major problem in crop production because of the presence of weed is continuously while the infection to the pest and disease problem is sporadic (Gianessi and Sankula, 2003).

Weeds have a tendency in compete for the nutrients, water uptake with the desirable plant, thus reduce the quality and quantity of the production of valuable plants. Weeds have a characteristic that always show they are more competitive compare to native plants, including seed production, growth rate, and the ability to grow under a wide range of environmental conditions (Weber, 2003; Groves et al., 2005; Pauchard et al., 2009).Generally, there are three types of weeds, these include annual weed, biennial weed, and perennial weed. The major problem to control is perennial weed because they can live throughout of the years.

Every each year, weeds cause a major problem in losses the natural resources of agriculture, forestry, fisheries, water supply and interfere human's enterprises. They also affect the human's health in the world (Henderson and Anderson, 1966). Because of this problem, there are many ways to reduce the impact of weed problem to the crops production. Basically, the real practices that have a valuable and effort in controlling weeds are mechanical and chemical practices (Ross and Carole, 1999). Mechanical weed

control is a physical activity that prevent undesirable plant growth by removing, injure or killing it. Mechanical weed control methods are used at very early weed growth stages such as hoeing; weed harrowing, torsion weeding, finger weeding and brush weeding (Baumann, 1992; Rasmussen, 1992; Ascard & Bellinder, 1996; Melander, 1998a). While chemical weed control method is using any herbicide by spaying the target.

1.2 Chemical use to control weed

Herbicide is mostly used by the farmer to control weeds. Herbicides also known as weed killers, are used to kill or injure undesirable plant. In U.S, herbicides are used to reduce the population of weed of about 220 million acres of cropland. More than 90% of the acreage of most field crops such as vegetable, fruit, nut, and specialty crops are treated with herbicides annually (Gianessi &Williams, 2012). The function of herbicide is disrupting the essential process in plant such as photosynthesis and nutrient uptake. By understanding the use of herbicides, it could help farmer how to control the weed.

However, not all the plants treated with herbicides will give 100% effectiveness; some herbicides actually need surfactants in order to work. Adding surfactants will increase the toxicity of herbicides towards the target plants compared with herbicide alone. Herbicide performance has been improved by adding surfactant since organic herbicides were first developed in the 1940s (Hodgson (1998). Technically, a surfactant acts as a soluble compound that reduces the surface tension of liquids or reduces interfacial tension between a liquid and a liquid or a liquid and a solid.

1.2 **Rainfall reduce herbicides efficacy**

Environmental factors could affect the performance of herbicides application. The effectiveness of most foliar-applied herbicides is reduced if rain falls soon after application (Muzik 1976). It can be directly influence the herbicides by leaching from the surface of leaf after application. The rainfastness depends on the type of herbicides. Most of herbicides have a rainfastness time limit on the label. The intensity and duration of rainfall are also affecting the rainfastness. In addition, the rainfastness also depends on the adjuvants uses. Adjuvants improved the rainfastness of herbicides (Kudsk et.al 1989).

1.4 Objective

- To determine the influence of surfactants on the rainfastness of glyphosate *on Paspalum conjugatum.*

1.5 Problem statement

The herbicide retained on the plant after spray is subjected to various environmental factors. The most important is rain particularly following spraying with systemic herbicide such as glyphosate. Adding surfactant could improve the rainfastness of glyphosate.

1.6 Justification of study

To present this work, the research was conducted at the field 2, UPM, Serdang to determine the efficacy of glyphosate (Roundup) with the addition of surfactants and its performance toward rainfastness in controlling *Paspalum conjugatum*.

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