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MORPHOLOGY AND GROWTH AMONG MUTANT TURFGRASS CULTIVARS UNDER DIFFERENT RATES OF NITROGEN

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MORPHOLOGY AND GROWTH AMONG MUTANT TURFGRASS CULTIVARS UNDER DIFFERENT RATES OF NITROGEN

BY

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CERTIFICATION

This project report entitled "Morphology and Growth Among Mutant Turfgrass Cultivars Under Different Rates of Nitrogen" was prepared by Nurnabilah Binti Sabri and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor in Horticultural Science.

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LIST OF ABBREVIATIONS

et al.	Et alia
^{0}C	Degree centigrade
spp.	Species
cm	Centimeter
g	Gram
RCBD	Randomized Complete Block Design
ANOVA	Analysis of variance

ABSTRAK

Satu eksperimen telah dijalankan di Unit Turf, Taman Pertanian Universiti, Universiti Putra Malaysia (UPM) untuk mengkaji kesan kadar nitrogen terhadap pertumbuhan dan morfologi kultivar – kultivar mutan rumput turf. Bahan tanaman yang digunakan dalam kajian ini ialah daripada 5 jenis mutan spesies rumput kerbau (*Axonopus compressus*) dan 5 jenis mutan spesies rumput Bermuda (*Cynodon dactylon*). Baja Urea telah digunakan mengikut kadar nitrogen 0, 0.15, 0.30, and 0.45kg/100m^2/bulan bagi *Axonopus compressus* dan 0, 0.25, 0.50, 0.75kg/100m^2/bulan bagi Bermuda. Baja Urea diberi setiap dua minggu. Eksperimen ini dijalankan dengan menggunakan reka bentuk blok rawak lengkap dengan dua faktor dan empat replikasi. Setiap kultivar – kultivar mutan rumput turf yang berumur tiga bulan diberi baja Urea selama 28 minggu pada setiap awal pagi. Data pertumbuhan dan morfologi rumput turf yang direkodkan termasuklah ciri – ciri morfologi, kadar pertumbuhan, ciri – ciri daun (panjang dan lebar), kepadatan pucuk, isipadu akar, berat kering pucuk dan akar, dan nisbah berat kering akar terhadap pucuk.

Keputusan kajian menunjukkan bahawa terdapat perbezaan di antara kultivar – kultivar di dalam setiap spesies dan rawatan berdasarkan kadar baja yang berbeza digunakan. Bagi spesies *Axonopus compressus*, rawatan nitrogen 0.489 gram (T3) telah menunjukkan kesan terbaik terhadap pertumbuhan mutan *Axonopus compressus* cv A13, *Axonopus compressus* cv A23, *Axonopus compressus* cv A26 - 2, *Axonopus compressus* cv A48, dan original of *Axonopus compressus* (kawalan). Kultivar terbaik keseluruhan

bagi spesies *Axonopus compressus* ialah mutan *Axonopus compressus* cv A23 dan mutan *Axonopus compressus* cv A48 .

Bagi spesies hybrid *Cynodon dactylon*, rawatan nitrogen 0.815 gram (T3) telah menunjukkan kesan terbaik terhadap pertumbuhan mutan *Cynodon dactylon* cv Satiri, mutan *Cynodon dactylon* cv TifEagle, *Cynodon dactylon* cv Tifdward, *Cynodon dactylon* cv TifEagle, dan original *Cynodon dactylon* cv Satiri (kawalan). Kultivar terbaik keseluruhan bagi hybrid *Cynodon dactylon* ialah original *Cynodon dactylon* cv Satiri (kawalan). Kajian ini perlu diulangi untuk mendapatkan keputusan yang sahih.

ABSTRACT

An experiment was conducted at Turf Unit, Taman Pertanian Universiti, UPM to study the morphology and growth among mutant turfgrass cultivars under different rates of nitrogen. Five cultivars of each mutant Cowgrass (*Axonopuss compressus*) and Hybrid Bermudagrass (*Cynodon dactylon*) were used as planting materials. Urea fertilizer was applied as the source of nitrogen at different rates 0, 0.15, 0.30, and 0.45kg/100m^2/month for Cowgrass, and 0, 0.25, 0.50, 0.75kg/100m^2/month for Bermudagrass. The fertilizer was applied every two weeks in both species. The experiment was arranged in Randomized Complete Block Design (RCBD) with two factorials and four replications. Urea fertilizer was applied to three months old mutant cultivars for 28 weeks in the early morning. Growth and morphological data visual (ligule, auricle, vernation, leaf blade and sheath, and collar), growth rate of coverage (m^2), leaf characteristics (length and width) (cm), plant density, root volume (cm^3), shoot and root dry weight (g), and ratio of dry weight of root to shoot were recorded.

The result revealed that there were significant differences among the cultivars in each species based on the different rate of fertilizer application. For *Axonopus compressus*, the treatment of nitrogen application of 0.489 gram (T3) gave the best effect on growth of mutant *Axonopus compressus* cv A13, *Axonopus compressus* cv A23, *Axonopus compressus* cv A26 - 2, *Axonopus compressus* cv A48, and original of

Axonopus compressus (control). The best cultivar for this species was *Axonopus compressus* cv A23 and *Axonopus compressus* cv A48.

For Hybrid *Cynodon dactylon*, the treatment of nitrogen application of 0.815 gram (T3) gave the best effect in growth of mutant *Cynodon dactylon* cv Satiri, mutant *Cynodon dactylon* cv TifEagle, *Cynodon dactylon* cv Tifdward, *Cynodon dactylon* cv TifEagle, and *Cynodon dactylon* cv Satiri (control). The best cultivar for this hybrid species was hybrid *Cynodon dactylon* cv Satiri (control). The experiment needs to be repeated to confirm these results.

CHAPTER 1

INTRODUCTION

Turfgrasses are plants from family *Poaceae* with roots and rhizomes known as vegetative ground cover that persists under regular mowing and traffic (Wiecko, 2006). It can be divided into two main groups which are cool – season grass and warm – season grass based on their temperature tolerance. The cool – season grass will grow in temperature range about 15 – 24ºC and the warm – season grass will be predominantly grown in temperature range about 26.5 – 35ºC (Brown, 2005). Malaysia is a tropical country. So, our country has high temperature that suited to warm – season turfgrasses such as *Axonopus compressus*, common and hybrids of *Cynodon dactylon*, *Zoysia spp.*, and so on.

Aldous (2011) described the turfgrass industry as comprising the establishment, management, and production of specialized grasses for utility, beautification, and recreation amenity. It is also involved science and technology, business management, manpower development, and turfgrass production and services. Turfgrass industry is normally associated for the golf industry that has grown rapidly around the world about more than 31,000 golf courses in this world (Christians, 2011). In Malaysia, turfgrass industry usually represents golf industry where we have about 206 golf courses. This is because of high costing especially in management and maintenance to provide the best

golf course for the golfers that can give profits to the entrepreneurs and the golf club. The costing included from site preparation until post planting care.

Moreover, turfgrass can be divided into three parts which are the functions, sport and recreation amenity, and ornamental purposes that can be identified. Firstly, turfgrasses can be functioned in reducing soil erosion. Its dense growth and extensive root system prevent soil erosion by wind and water especially in rainy day (Weicko, 2006). It also can be used to reduce pollution especially for noise abatement, glare reduction, and visual pollution problem at the highway due to rough surface of turfgrass. It removes smoke and dust from the atmosphere, and it releases oxygen into the air (Idous and Chivers, 2002). It does not only serve as safety factor but also can prevent vital soil resources because it has a greater absorption and retention rate In addition, turfgrass provided safety like cushioning to minimize the injury to the players (Turgeon, 2008).

Secondly, turfgrass also aided in sport and recreation amenity by giving natural setting and peaceful relaxing space. It also improved community pride and provided good and comfortable living space to the community. Besides that, it will be the ideal place for playing, organizing or relaxing to the people surrounding (Emmons, 2008). Thirdly, in ornamental and landscape views, turfgrass help in support the landscapes for beautification and attractiveness especially for human activities. In addition, the aesthetic values from the cool, clean, and natural green of turfgrass specifically the

aesthetic affect of parks, gardens, and lawns help in releasing stress and improve mental health as well as contribute to social harmony, stability and generally improve quality of life (Stewart, 2008).

In order to get the best types of turfgrass, lot of studies have been done through breeding programme in selection of superior grasses for a particular application by choosing individual grass that displayed desirable characteristics especially for growth and morphology parts. Resistance of disease and pest, shade, salinity, temperature, and so on also being countered to ensure the turfgrass selected will be the best cultivars produced that can growth healthily and increase visual pleasure or aesthetic appeal.

Therefore, they are several steps in turfgrass establishment such as species and cultivars selection, site preparation, turfgrass planting, and take care of turf after planting to ensure. This is to ensure the new turf can be established better. There are several methods to plant the turfgrass either by seeds or vegetative such as sodding, plugging, stolonizing, and sprigging (Christians, 2007). In turfgrass planting, stolonizing method can be used to establish new turfgrass where it can give high rate of establishment than sprigging method. Topdressing is applied in range of 0.15 to 0.25 inches to cover the new stolons and rolling that establishment area to get soil and stolons good contact. Irrigation should be immediately applied after topdressing and others cultural practices being applied according to the schedule (Emmons, 2008).

In order to take care of the new turfgrass growth and establish, fertilization must be applied. This is important for new turfgrass get their vital nutrients. They are 17 elements needed to be uptake by the turfgrass according to their requirements. These elements can be divided into macronutrients and micronutrients. Macronutrients can be further divided into primary elements and secondary elements. In primary elements, there are elements such as nitrogen, phosphorus, and potassium. These nutrients need to be applied in larger quantity as compared to secondary nutrients especially the nitrogen which is fast release fertilizer or easily leaching (Dunn and Diesburg, 2004). The secondary elements are such as calcium, magnesium, and sulfur. Calcium and magnesium can be supplied into the soil through application of lime while, the sulfur is added to the soil through fertilizer that contains sulfur like aluminum sulfate. The micronutrients or trace elements need to be applied in small quantities. The examples of micronutrients such as chlorine, molybdenum, zinc, copper, and so on (Christians, 2007).

However, quality of turf grass can decline due to undesirable morphological characteristic (coarse textured and slow growing) and lack in optimum amount of nutrients needed for better morphology and growth. In addition, lack in management of fertilizer program can cause high in management cost due to excessive or less use of fertilizer that affect the cultivars growth. Based on previous research, mutation breeding produced new potential cultivars that have better quality but have not been fully studied for fertilizer application.

Therefore, this study was conducted to determine the optimum rate of nitrogen fertilizer that used by mutant turfgrass cultivars for better growth. The objectives of the study were to determine the optimum amount of nitrogen fertilizer needed for different types of mutant turfgrass cultivars and to evaluate the growth performance of different types of mutant turfgrasss cultivars under different rates of nitrogen.

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