VOL. 11, NO. 21, NOVEMBER 2016 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

SURVEY ON NATIVE ZOYSIAGRASS IN INDONESIA: ITS SPREAD AND CHARACTERISTICS

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ABSTRACT

In Turfgrass studies, Zoysiagrass is a very popular one which has impressive, dry soil tolerant and nutrient-efficient featurs among other Turfgrass. This study serves as a novel pilot study in Indonesia to determine the existence of Zoysiagrass in paryicular areas of the country. The study begins with a survey into several geomorphology zones such mountains, highlands, coastal and karst region and sea side. This stage concerns any possible Indonesian native Zoysiagrass considering morphological diversity as well as the quality, and its habitat. The study wa sthen followed by cultivation processes in containers within the Laboratory of Agriculture. Based on our analyses, it is found that Zoysia Japonica is specifically an Indonesian Native Zoysiagrass which existence were spread from high mountain of 1000 m above sea level to the beach with approximately 1 m above sea level. These are found on the north and south coast of Java and Bali islands. Finally, analyses on their characteristics are discussed in depth as well as its market potentials for future research direction.

Keywords: turfgrass, zoysiagrass, spread, characteristics, Indonesia.

1. INTRODUCTION

Generally, the growing interests on turfs scarce the adaptability of foreign varieties of zoysia to the prevailing pedologic and climatic condition. Thus it is necessary to collect native germaplasm resource of Zoysiagrass species, with the aim of selecting and adapted varieties. East and south East Asia are the native existence of zoysiagrass which naturally distributed on sea side and grass lands. Zoysia grass including chlorisoideae subfamily, which have optimum growth at 25-35^{0}C and adapt in the tropics and subtropics. East and Southeast Asia is native Zoysia, which mostly spread on the beach and pasture land.

Five Species have been identified from South Korea, of these are Zoysia japonica, Zoysia Jeungji, Zoysia matrella, Zoysia macrostacia, and Zoysia sinica (Jang *et al,* 2010), whereas in Japan is five species mainly Zoysia japonica, Zoysia matrella and Zoysia tenufolia (Kitamura, 1989). Zoysia also widely distributed in eastern area of China with various ecological types (Jin *et al.*, 2004). Asia, Australasia, Pacific island and temperate region are the habitat of 11 species of Zoysia Willd. Genus (Engelke and Anderson, 2003). Xie *et al*., (2012) reported that zoysia genus consist of 16 species and naturally distributed on sea cosata and grassland around the East Asia. Even though Zoysia genus consist of 16 species, but only Zoysia japonica, Zoysia matrella and zoysia tenufolia have been used as turfgrass (Losch *et al*., 2005; Xie *et al*, 2012). Other, Zoysia sinica has been used as turf (Samudio, 2000), beside Zoysia macrantha (Losch *et al*., 2005). Zoysia japonica exists and is used as extensive turf in Korea, Japan and China (Choi, 1997; Fukuoka, 1989; Xie *at al.*, 2012). Commonly Zoysiagrass which used as extensive turf establishment is zoysiagrass with well developed stolon and short culm thus can form dense swards (Weng *et al*., 2007).

Morphology characteristics assessment of zoysiagrass is still important to help researchers in developing breeding system. Choi *et al*. (1997) had evaluated the morphology and isozyme pattern of Zoysia sp. Collected from Korea. Morphological characteristics varied among species (Kitamura, 1970). However, morphological characteristics are not strong enough to map the genetic variation, especially when distinguishing grass in the same species but different cultivars, because the phenotype is not influenced by genetic hanay but also influenced by lingkuangan (Xie *et al*., 2012).

Diversity in genetic in natural population related to morphological characteristics of wild Zoysia in Korea already investigated (Choi and Yang, 1996). However, morphology character is the simple and easy to assess the diversity of Zoysia, even though morphological characteristics are less adequate to reveal genetic differences among cultivars (Xie et al, 2012), and among species (Kitamura, 1970). However, Choi *et al*., (1997) evaluate the diversity of Zoysiagrass of Korea by using morphology character. In Japan, same method was used by Kitamura (1970). Extensive diversity of DNA among species of Zoysiagrass collected in Korea also was found by Choi and Yang (1996). However, morphological characteristics is a simple and easy way to distinguish the diversity Zoysia, although morphological characteristics have not been able to fully portray the genetic diversity (Xie *et al*, 2012), although the difference in species (Kitamura, 1970).

Zoysia grass has needle-shaped leaves with a flat surface. 2-4 mm wide and 3-11 mm in length. long delicate hairs found on the 0.02 cm ligula (Beard 1973). Inflorescence short, tip (terminal) and shaped nails. Stems are round, producing many stolons and rhizome for vegetative breed, while the generative breeding by seed. Zoysia grass shade tolerant and can be grown in the hot

and humid regions. This grass has the adaptability to the soil well drained, fine textured and fertile with a pH of 6-7 and have tolerance for various soil types. Zoysia grass has ducked growth and form a compact and tough grass. The rate of formation and the rate of recovery of damages Zoysia grass is slow because its growth rate is also slow, especially lateral shoots (Beard 1973). Besides this grass is resistant to soil compaction (Carrow and Petrovic 1992). Matrella Zoysia species more tolerant to salinity than Zoysia japonica. Zoysia leaf color is also better than bermuda grass (Cynodon dactylon L.) that is dark green (Aaron, 2010). Aaron (2010) reported that Zoysia japonica has wider leaves (> 2 mm) than Zoysia matrella (<2 mm).

In Indonesia, wild zoysia has not been reported of their existence, whereas usage zoysiagrass as turf is only zoysia matrella. The aim of this study is to know the existence of Zoysiagrass in Indonesia, by characterizing of the morphological and their habitat characteristics. Using of native turfgrass, may the turfs have great ability to quickly recover sward thinning cause of traffics and wearing, since foreign varieties often less adaptive to the local environment. This paper include some information on the collection environment and the preliminary ex situ evaluation of the collected Zoysia germaplasm.

2. METHODOLOGY

This research broadly encompasses survey and collection of natural grass Zoysia sp, superior strain selection based on quality. This study takes the target availability of germplasm Zoysia sp, which can be cultivated farmers and can be used as an athletic field grass such as football, golf courses and parks. Germplasm collection covers most areas of Central Java and Bali, are planted on field laboratory of Agriculture Faculty UNS.

Survey and grass collection was conducted in mountains, coast, highlands, and karst area randomly. Administrative location, geographical position, soil type and characteristics of the ecological environment of each grass were obtained. In Jawa island, the mountain areas surveyed were Merapi, Merbabu, Lawu, Sindoro, Dieng and Ungaran, whereas the sea side areas were Jepara, Bantul, Gunung Kidul and Pacitan, and Karimunjawa island. In Bali Island, the areas surveyed were Gilimanuk, Nusa Dua, Badung and Denpasar.

Evaluation of the quality of the grass covering the visual quality of a texture, uniformity, shoot density, growth rate and rooting, also level of surface coverage was observed with a large pot of 60 cm diameter, with a planting medium of mixing soil, sand and organic material by the volume ratio of 1:10 v olume/volume. Maintenance of grasses growt given the irrigation of 100% evapotranspiration wiith 3 days interval, and was applied fertilizer NPK 4-1-2 with a par lecturer N 15 g/m2.

In terms of color evaluationm we used Munshell Color Chart with green color chart scale of 1-5. Visual quality of turfgrass was evaluated with NTEP method with scale of 1-9, while plant height and leaf width were measured with calipers ruler.

3. RESULTS AND DISCUSSIONS

In mountainous areas surveyed, Zoysia was found only in south side of Merapi Mount in Jogjakarta Province and Gedong Songo Semarang District, whereas Merbabu, Lawu and Sindoro and Dieng Plateau was not found.

Generally the coastal areas was more suitable as habitat of Zoysia in Indonesia due to in many surveyed place was found Zoysia, such as Changgu Nusa Dua Bali beach, Jepara Bandengan beach, Kepuluan Karimunjawa beach, Parangtritis beach and Kulon Progo Glagah beach.Thus Zoysia may can be develop as saline area turfgrass in Indonesia

Commonly Zoysia grass was found in sandy soil and Entisols, even though also was found in Inceptisol, Andisol and Vertisol. The finding in the sandy soil is more dominant than the other soil. Zoysia finding on Andisol soil just in Gedong Songo mountain with very few colonies. The large colonies of Zoysia was found north sea side Java Island. Zoysia existence in heavy clay Vertisol soil only was founded in Kulon Progo district, while on carst area as soil with high lime content was not found any Zoysia.

In general, points where the Zoysia be found were varied place such as roadside, field, and on the sea side. Zoysia grass grows at an altitude of between 1 m elevation above sea level up to 1240 m asl. Therefore Zoysia found in broad distribution of land, soil and elevation in Indonesia

As presented in the above table, it can be seen that the native Zoysia Indonesia has leaf width varied, ranging from 2.7 mm to 4.3 mm, while for Zoysia matrella have a leaf width between 1.5 to 2.5 mm. Another characteristic is that native Zoysia spp does not have a trachoma on the lower surface of the leaf. Zoysia leaf color ranges from 3 to 4 and ore that has a lot of upper leaf color ranges from a score of 4 and lower leaf color ranges from 3 colors. Plant height also varies, with between 5.7 to 21.7 cm, while the Zoysia matrella range 4.1 to 7.8 cm. Generally Zoysia spp Internode has green-purple color and purple with Internode length of 3-4 cm.

The visual quality of Indonesian native Zoysia pretty good, reaching 7.88 for NTEP scale (1-9). 9 scale usually intensively reared with fertilization and maximum care, and generally has been cultivated on farms and used on the golf course. 7.88

Such quality can be improved if we perform more intensive cultivation. However, the quality of native Zoysia is verying, due to among founded Zoysia, its visual quality is only about 6.15. Besides the quality, diversity is also shown in leaf width or texture.

Table-1. Result of native Zoysiagrass in Indonesia.

Sim bol	Place name	District	Geographic position		Elevation	Soil type	colony	Habitat
			Nort	East				
ZJ01	Prambanan	Sleman	7° 45' 06,48"	110° 29' 26,09"	163	Inceptisol	Rather many	Resort lawn
ZJ02	Tabanan	Bali	8° 32' 29,15"	115° 07' 27,28"	124	Inceptisols	Rather many	lawn
ZJ03	Ngemplak	Sleman				Entisol	little	ground
ZJ04	Gedong songo	Semarang	7° 12' 40,80"	110° 21' 25,84"	1240	Andisol	Very little	Resort area
ZJ05	Cangkringan	Sleman	7° 38' 50,03"	110° 26' 34,97"	503	Inceptisol	little	Road side
ZJ07	Bandengan	Jepara	6° 33' 11,57"	110° 39' 17,38"	4	Entisols	Many	Ground
ZJ09	Kinahrejo	Sleman	7° 36' 19,47"	110° 27' 17,55"	850	Entisol	Little	River side
ZM10	Solo	Solo	7° 33' 25,10"	110° 48' 26,10"	102	Alfisols	Many	Lawn
ZJ11	Bandengan	Jepara	6° 33' 16,55"	110° 38' 58,15"	1	Sand	Many	Sea side
ZJ12	Changgu	Denpasar	8° 38' 55,60"	115° 07' 03,18"	4	Sand	Little	Sea side
ZJ13	Kepuh harjo	Sleman	7° 36' 20,05"	110° 26' 34,50"	843	Entisol	Little	Sea side
ZJ15	Parang tritis	Bantul	8° 01' 22,56"	110° 19' 59,33"	10	Sand	Little	River side
ZJ16	Manahan	Solo	7° 33' 21,03"	110° 48' 25,15"	102	Sand	Many	ground
ZM17	Glagah harjo	Sleman	7° 36' 50,03"	110° 276' 41,13"	746	Inceptisols	Little	River side
ZJ18	Karimunjawa	Jepara	5° 51' 43,69"	110° 25' 53,82"	3	Sand	Rather many	Sea side
ZJ19	Sanden	Bantul	7° 55' 22,56"	110° 21' 03,29"	35	Entisols	Little	Road side
ZJ22	Prambanan	Sleman	7° 46' 14,44"	110° 28' 56,86"	495t	Inceptisol	Little	Road side
ZJ23	Prambanan	Sleman	7° 45' 06,48"	110° 29' 26,09"	163	Inceptisol	Rather many	Resort lawn
ZJ24	Glagah harjo	Sleman	7° 36' 50,03"	110° 276' 41,13"	746	Inceptisols	Little	River side
ZJ25	Jetis	Bantul	7° 58' 43,82"	110° 21' 03,29"	15	Inceptisols	Little	Road side
ZJ26	Ngemplak	Sleman			410	Inceptisols	Little	ground
ZJ27	Parangtritis 2	Bantul	8° 01' 33,49"	110° 20' 05,05"	10	Sand	Little	Sea side
ZM28	Karimunjawa	Jepara	5° 51' 43,69"	110° 25' 53,82"	3	Sand	Rather many	Sea side
ZJ29	Cangkringan	Sleman	7° 38' 50,03"	110° 26' 34,97"	503	Inceptisols	Little	Road side
ZJ31	Bandengan 3	Jepara	6° 33' 08,44"	110° 39' 08,10"	1	Entisols	Many	Sea side
ZJ32	Cangkringan	Sleman	7° 38' 50,03"	110° 26' 34,97"	503	Inceptisols	Little	Road side
ZJ33	Changgu 2	Bali	8° 39' 05,24"	115° 07' 16,94"	2	Sand	Little	Sea side
ZM34	Solo	Solo	7° 33' 25,10"	110° 48' 26,10"	102	Alfisols	Many	Park area
ZJ35	Kepuh Harjo	Sleman	7° 36' 20,05"	110° 26' 34,50"	843	Entisols	Little	Upland area
ZJ36	Changgu	Bali	8° 39' 05,24"	115° 07' 16,94"	2	Sand	Little	Sea side
ZJ37	Banguntapan	Bantul	7° 54' 46,70"	110° 21' 59,56"	38	Vertisols	Little	Road side
ZJ38	Changgu	Bali	8° 39' 05,24"	115° 07' 16,94"	2	Sand	Little	Sea side
ZJ39	Changgu 2	Bali	8° 39' 05,24"	115° 07' 16,94"	2	Sand	Little	Sea side
ZJ41	Wates	Klnprogo	7° 52' 31,59"	110° 08' 06,06"	19	Vertisols	Little	Ground
ZJ42	Glagah	Klnprogo	7° 54' 50,48"	110° 04' 36,36"	21 ft	V ertisols	Many	River side
ZJ43	Glagah	Klnprogo	7° 54' 44,50"	110° 04' 54,73"	34 ft	Vertisols	Little	Ground
ZJ44	Bugel Galur	Klnprogo	7° 56' 24,63"	110° 09' 41,50"	52 ft	Vertisols	Little	Road side
ZJ45	Galur	Klnprogo	7° 56' 53,53"	110° 10' 53,19"	18 ft	Vertisols	Many	Road side

In addition, Coarse Texture can be used for soil conservation area, football field or yard and garden, but not suitable for a golf course. Texture is too small not suitable for a football pitch but lets be planted on the golf course. Apparent differences in texture between Zoysia Zoysia japonica with matrella, although in one species diversity also has texture.

Germplasm maintenance and quality visual and functional information to facilitate the acquisition of a combination of cross breeding new cultivars to obtain better quality.

4. CONCLUSIONS

This paper presents an initial approach to study Native Zoysiagrass in Indonesia, in terms of its spread and characteristics. In summary, we can conclude this study as follows :

a) Zoysia Japonica is an Indonesian native grass, and spread of the mountain with an altitude of 1000 m above sea level, the effect is on the beach with a height of 1 m above sea level and spread over the north and south coast of Java and Bali, and there is a diversity of morphological characters on Zoysia species japonica, and also in matrella Zoysia species.

b) Zoysia SP Grown in soil that is mixed with entisols, Inceptisol, Vertisol and Andisol, showed that Zoysia grows on sandy soil until the soil is heavy Klei, and its habitat is coastal, mountain and roadsides.

c) Native Zoysia has a variety of qualities ranging from 6.19 to 7.88 on a scale of 1-9 quality, so the quality is reached above 7.5 can be released to the market as a cultivated crop is ready.

d) The need for maintenance and protection of genetic resources, to maintain biodiversity and also the availability of further research.

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