2nd GEN (Gadjah Mada-Ehime Network) Seminar

–Self-sufficiency on Agricultural Production–

April 3 – 4, 2009

Faculty of Agriculture
Ehime University, Japan

CONTENTS

On Gadjah Mada-Ehime Network

Adi Djoko Guritno, Gadjah Mada University
T. Sweda, Ehime University

The formal tie between Gadjah Mada University (UGM) and Ehime University (EU) was established in May 2007 by Rector Sofian Effendi of UGM and President Masayuki Komatsu of EU as a MOU to exchange publications, professorial staff and students. This tie was soon materialized by the UGM delegates consisting of Dean A. Rozaq and chairs of agriculture-related Departments visiting the Faculty of Agriculture, EU in April 2008 and proposed a joint seminar to identify the research areas of mutual interest to work with.

Accordingly Gadjah Mada University hosted an international seminar in Yogyakarta in August 2008, to which EU sent several professors and a few administrators including Dean Izumi. In addition to the seminar of mutual introduction to the past and on-going research at the respective institutes mainly in the field of environmental studies at the seminar, two major decisions were made at the business meeting thereof. One was the agreement to host alternately an annual seminar on food, agriculture and environment in continued search for research areas and topics of mutual interest as well as to further promote academic exchange and cooperation. The other is invitation of young Indonesian scientists to EU to initiate joint research and deepen understanding.

According to this August 2008 Agreement between Dean Rozaq of UGM and Dean Izumi of EU, four young professors and a graduate student from UGM and Gorontaro University are presently involved in joint research at their counterpart laboratories in the Faculty of Agriculture, EU. Also in accordance with the Agreement, the Second GEN Seminar is now hosted by EU as in the following.

The tie between the two institutions is rapidly growing, e.g. the next group of young Indonesian scientists to be invited to EU in the 2009 fiscal have already been appointed with a funding from the Japan Society for Promotion of Science, and another funding application to the Ministry of Science and Education, Japan has been filed for a Japan-Indonesia joint research on tropical forest carbon budgeting with EU and UGM representing the respective countries.

2nd GEN (Gadjah Mada-Ehime Network) Seminar Programme

The 2nd GEN Seminar is held as in the following in accordance with the agreement between Gadjah Mada University (UGM) and Ehime University (EU) to host alternately an annual seminar on food, agriculture and environmental issues to promote academic exchange and cooperation between Indonesia and Japan.

Date: April 3 (Friday) – 4 (Saturday), 2009
Venue: Lecture Hall, Faculty of Agriculture, Ehime University, Japan
Topic: Self-sufficiency on Agricultural Production

April 3 (Friday)

(1) Opening Address (10 min. each) 9:30–9:50 Moderator: K. Osozawa

Welcome Address ..... E. Izumi (Former Dean, Fac. Agric., EU)

Redesigning Asian Agricultural Higher Education to Promote Sustainable Agricultural Development ..... Djagal W. Marseno (Dean, Dept. Agr. Tech., UGM)

(2) On Gadjah Mada-Ehime Network 9:50–10:20

Trust, Connection, Prosperity: A Future Paradigm of GEN..... Adi Djoko Guritno (UGM)

Ongoing GEN Projects..... T. Sweda (EU)

On KKN (Student Community Service)..... Mohammad. Affan (UGM)

Break 10:20–10:30

(3) Keynote Address (30 min. each) 10:30–11:50 Moderator R. Hu (EU)

Is Food Self-sufficiency Important? -The Present State and Problems of Food Self-sufficiency in Japan- ..... M. Okuma (EU)

Pre-Biotic from Local Tuber Plants ..... Sri Raharjo (UGM)

Discussion

Lunch Break 11:50–13:00

(4) Technical Session (15min. presentation, 5 min. Q & A each) Moderator: O. Kobayashi

Session 1: Production and Distribution 13:00–14:30

Design of Grain Aeration for Corn Storage..... Nursigit Bintoro (UGM)

Development of Controlled Environment for Sustainable Horticultural Production in the Tropics..... Mohammad Affan (UGM)

Potentialities of Dwarf Elephantgrasses (*Pennisetum purpureum*) Grown in Japan and Indonesia ..... Mukhtar, M. (Gorontaro U)

Precision Production System for Effective Bio-greening Material..... Mirwan Ushada (Osaka PU)

Analysis of Supply Chain of Tropical Fruits in Indonesia: A Case Study in Yogyakarta Province..... Yuliando, H. (UGM)

Break 14:30–15:00

Session 2: Environmental Issues 15:00–17:00

Problems Associated with Agricultural Development of Tropical Swamp Forests..... T. Shimamura, (EU)

Past 50 year Change in Farmland Area of Ehime Pref., Japan..... Y. Maeda (EU)

Starting GEN, Starting MEU - Way of Collaboration in Entomology..... H. Yoshitomi (EU)

Managing Abundance and Diversity of Belowground Arthropods to Sustain Friendly Agricultural System..... Nugroho Putra (UGM)

Effects of Latitude, Altitude and Temperature Variation on Distribution of Ichneumon Fly..... K. Takasuka (EU)

Evaluation of Immunostimulation Effect of Oligosaccharide..... Ika Kumalasari (UGM)

(5) Closing Address ..... K. Hayashi (Dean, Fac. Agr. & Chair, Ehime-Indonesia Friendship Soc., EU)

April 4 (Saturday)

Business Meeting

Dean's Office, 10:00–12:00

Agenda

(1) 2010 GEN Seminar in Indonesia
(2) Research Cooperation
(3) Student Exchange
(4) Satellite Offices

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Potentialities of Dwarf Elephantgrass (*Pennisetum Purpureum*) Grown in Japan and Indonesia

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Abstract

After breeding dwarf elephantgrass varieties in the United State , elephantgrass varieties were classified to be a normal type (tall elephantgrass) and dwarf type (including semi dwarf elephantgrass), and recently, the characteristics of the dwarf elephantgrass was compared with the normal ones in several areas of the world. Even though the dry matter productivity was higher in the normal varieties than in the dwarf varieties at any planting density and cutting frequency, DL tended to show a stable productivity with high PLB irrespective of planting density and cutting frequency. In addition, it had a high overwintering ability compared with the other varieties.

Introduction

Many cultivars of elephantgrass (*Pennisetum purpureum* Schumach) have been bred and propagated to practically all tropical and sub tropical regions where they are popularly grown for the cut-and-carry fodder and less often for grazing use. In Japan, normal elephantgrass varieties with high yielding forage crop are usually grown in several areas (Ito and Inanaga, 1988; Ito et al., 1988), under the cut-and-carry system in the southern part of Japan (Ishii et al., 1995). However, dwarf varieties have recently been grown and examined for their growth characteristics in the tropical and sub-tropical regions in the world (Cuomo et al., 1996; Hanna et al., 1988 and 1993; Kipnis and Bnei-Moshe, 1988).

After breeding dwarf elephantgrass varieties in the United State (Hanna et al., 1993), elephantgrass varieties were classified to be a normal type (tall elephantgrass) and dwarf type (including semi dwarf elephantgrass), and recently, the characteristics of the dwarf elephantgrass was compared with the normal ones in several areas of the world. Dwarf napiergrass facilitates hand-harvesting by farmers and is assessed to be more suitable for grazing than normal variety (Rusland et al., 1993; Williams and Hanna, 1995). Dwarf varieties introduced from Thailand were different from normal varieties in tiller number, mean tiller weight and percentage of leaf blade in a preliminary study using the plants in the established year (Ishii et al., 1998).

Both normal and dwarf elephantgrass planted in the tropical areas will be obtaining forages in all cutting season, while it will be getting different if their planting in the sub tropical areas as well as in Japan due to the winter season. Therefore, it should be measured the percentage of overwintering plant. The growth rate in the following year (regrowing from the stubble) is higher than that in the transplanted year, if the overwintering percentage is sufficiently high. In this study, only the plants in the year after establishment were used, since the productivity of elephantgrass in this region of southern Kyushu island is closely correlated with the overwintering ability (Ishii et al., 2000), as in some tropical grasses (Cai et al., 1999).

The objective of this study was to examine tiller development in the dwarf and normal elephantgrasses during two years establishment in the southern part of Kyushu, Japan.

Materials and Methods

1. Plant materials

The research was carried out at the Experimental field, Miyazaki University, Japan from April 2002 to April 2003. The examined varieties were two normal varieties, Wrukwona (Wr) and Merkeron (Me), introduce from Indonesia and two dwarf varieties introduced from Thailand to Japan in 1996. Since the two dwarf varieties were definitely different in the heading date, early-heading variety was termed DE and late-heading variety DL. Overwintered tillers of each variety were planted in April 2002, and the overwintered stubbles were used for the experiments in 2002 and 2003 except for DE, which was established by planting overwintered tillers on late April, 2002 and 2003 due to its low overwintering ability.

As a basal dressing, fermented cattle manure at 600 g/m^2 and slaked lime at 400 g/m^2, and 10 g of N, P_2O_5 and K_2O/m^2 of chemical compound fertilizer were applied as an additional dressing both in 2002 and 2003.

2. Experimental design and data analysis

The experimental plots were arranged in a blocked design of Latin square method. Plant spacing density was 50 cm × 50 cm (4 plants/m^2) and the plot size 12 m^2 (3 m × 4 m). In order to obtain different tiller development following two years, the plants were cut three times on July 5, September 11 and November 23 in 2002, and two times on July 31 and November 3 in 2003. The cutting height was fix at 10 cm above the ground surface.

The data were analyzed statistically by the analysis of variance and the difference in the mean value was calculated by the LSD method at 5 % level.

3. Sampling methods for the growing tiller

By three replications from each cutting time, plants for the growing tillers were analysis from a single plant and divided into each organ of the herbage part, stubble part and underground part.

In herbage part cut at 10 cm above the ground, plant characters measured were tiller number (TN) and dry matter weight (DMW) of leaf blade (LB), stem with leaf sheath (ST) and dead parts (D). In stubble part cut at the ground level to 10 cm above the ground. In underground part, characters were DMW of underground stem (UG) excluding roots. Top plant (TP) was determined by the total of herbage part. Total herbage (TH) was determined by the whole plant except UG.

Results and Discussion

1. Tiller number and weight

The changes in growth tiller number (TN) and mean tiller weight (MTW) with time were compared among normal (Wr and Me) and dwarf (DE and DL) varieties cut three times in 2002 (A) and twice in 2003 (B) are shown in Figure 1.

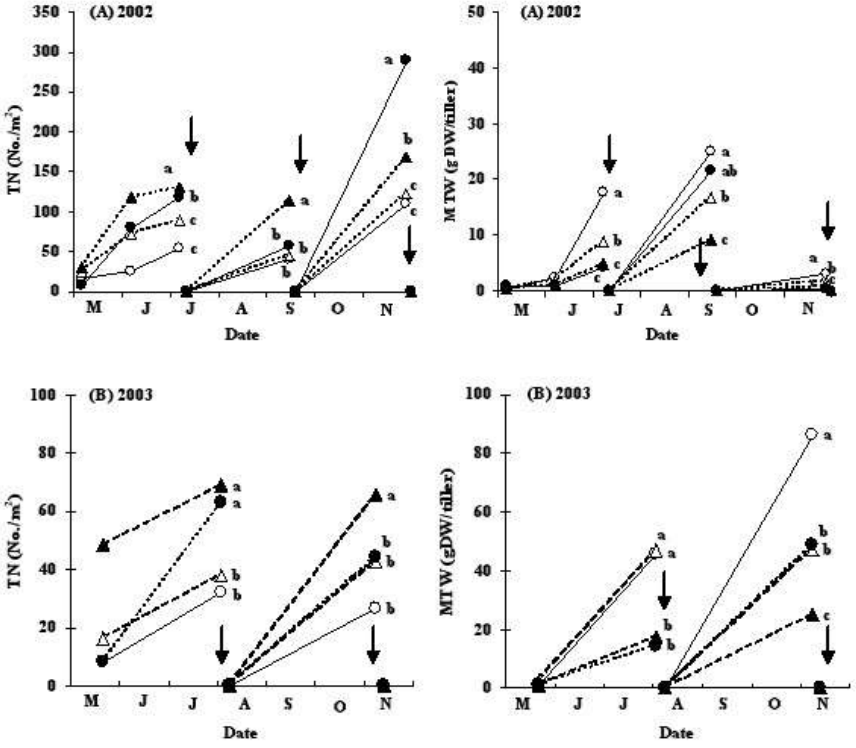
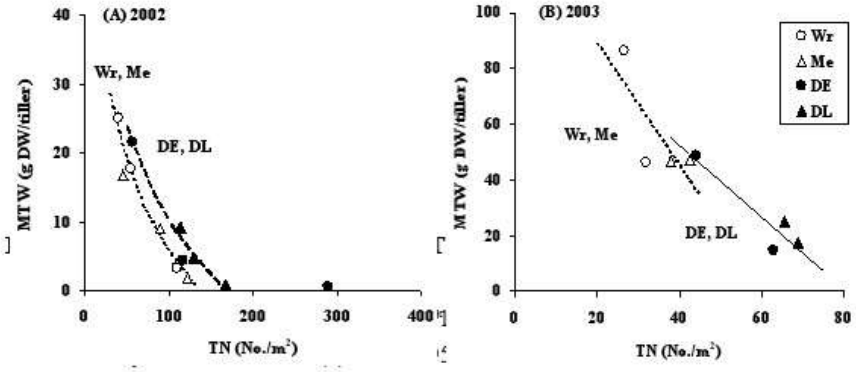


Fig. 1. Changes in with time in tiller number (TN) and mean tiller weight in 2002 (A) and 2003 (B).
Wrukwona (Wr, O), Merkeron (Me, Δ), Dwarf-early (DE, ●) and Dwarf-late (DL, ▲). Arrows indicate the dates of cutting at 10 cm above the ground surface. Figures with different letters denote significant difference among varieties at the same cutting date at 5 % level.

Tiller number (TN) was larger in dwarf varieties than in normal ones in both 2002 and 2003, and TN at the first cutting was almost similar to that at the second cutting, while that at the third cutting in 2002 was higher and this increase rate was significantly stimulated in DE. However in 2003, the tendency in TN with time was almost similar at the first with the second cutting. Hsu and Hong (1993) reported that the plants with more frequent cuts developed more tiller. The TN was generally larger in 2002 (cut three cuttings) than in 2003 (cut twice), which was the same tendency as the reports of Sunusi et al. (1997).

The mean tiller dry matter weight (MTW) was the heaviest in normal Wr, followed by Me, DE, and the lowest in DL at all cuttings in both years. It was the heaviest in September 2002 and November 2003 when plant length high was the highest. Thus, dwarf varieties, especially DL tended to emerge more tillers with less dry matter (MTW) than normal varieties. Since dry matter accumulates in stem at a higher percentage than in leaf blade in napiergrass (Ishii et al., 1996b), storage capacity in stem for dry matter was larger in normal varieties than in dwarf ones, except in the stem of DE elongated after the first cutting.

The relationship between MTW and TN cutting three times and cutting twice in were analyzed in normal and dwarf varieties in each of 2002 and 2003, respectively are shown in Figure 2.



(B) Wr, Me: $y = 132.4-2.180*(x)$, $R^2 = 0.583$ ($P>0.01$); DE,DL: $y = 104.8-1.300*(x)$, $R^2 = 0.853$ ($P<0.10$).

Fig. 2. Changes in mean tiller weight in (MTW) in 2002 (A) and tiller number (TN) 2003 (B).
Wrukwona (Wr, O), Merkeron (Me, Δ), Dwarf-early (DE, ●) and Dwarf-late (DL, ▲). Arrows indicate the dates of cutting at 10 cm above the ground surface. Figures with different letters denote significant difference among varieties at the same cutting date at 5 % level.

The relationships were negative and logarithmic in 2002 and linear in 2003, respectively. The ratio of MTW to TN tended to be higher in dwarf varieties than in normal varieties when TN was above 100 tillers/m^2 in 2002 and above 40 tillers/m^2 in 2003. In the grasses with many tillers also, a negative linear relationship between the logarithm of TN and MTW is expected. Gardner et al (1985) reported that cutting times with three to fourth times in subtropics area required for maximum dry matter yield (DMY), the flatter and logarithm slope. In the present experiment, the ratio of MTW and TN tended to be higher in the dwarf varieties than in normal varieties. This relationship suggest that both dwarf and normal varieties should be defoliated at higher cutting frequency to obtain a maximum TN as well as herbage dry matter yield (HDMY).

2. Tiller growth characters

The changes in growth characters and dry matter weight (DMW) during two years mean values were compared among 4 varieties of elephantgrass are shown in Table 1.

Table 1. Two years mean values (2002 and 2003) at each part of dry matter weight (DMW) among 4 varieties of elephantgrass after establishment.

Year	Varieties	Dry Matter Weight						
		LB	ST	D	TP	AG	TH	UG
		---------- gr/m² ----------						
2002	Wr	753.1	838.4	130.6	1722.2	463.4	2185.5	350.4
	Me	699.3	684.3	84.70	1368.3	604.8	1973.0	426.5
	DE	797.4	735.5	133.9	1666.6	804.9	2471.5	407.3
	DL	845.1	375.2	86.60	1306.9	582.3	1889.1	389.1
2003	Wr	989.4	1883.8	219.0	3092.2	284.6	3376.8	219.4
	Me	847.2	1574.6	111.1	2632.9	322.9	2955.9	290.6
	DE	1005.3	1413.4	201.2	2389.8	353.2	2743.1	192.2
	DL	1230.5	942.64	331.6	2209.8	594.9	2804.7	258.7

Variety : Wrukwona (Wr), Merkeron (Me), Dwarf-early (DE) and Dwarf-late (DL).
Herbage part : Leaf blade (LB), stem with leaf sheath ST), dead part (D) and
Stubble part : Above ground DMW (AGDMW)
Underground part : Under-ground stem (UG)
Top plant (TP) : Total of herbage part
Total herbage (TH) : Whole plant except UG

All varieties increased leaf blade dry matter weight (LBDMW) during the growth season from the first cutting to third cutting in 2002 and from the first cutting to that at the second cutting in 2003. LBDMW was generally larger in dwarf varieties than in normal ones in both years, although LBDMW showed not variable between varieties in 2002, while in 2003 showed significantly different among 4 varieties.

Conclusions

Even though dry matter productivity was higher in the normal varieties than in the dwarf varieties, dwarf variety DL (DPO line of Thailand) tended to show a stable productivity at any planting density irrespective of cutting frequency. This characteristic may be derived from high capacity of tiller emergence at the cutting as well as after overwintering and high dry weight percentage of leaf blade in DL, compared with the normal varieties.