PRODUCTIVITY OF *PANICUM DICHOTOMIFLORUM* MICHX., A PROMISING NEW FORAGE GRASS

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ABSTRACT
Since summer growth of forage crops limits cattle grazing and hay production in Korea, it is important to exploit the natural resources which are suitable for forage production. A series of experiments to establish cultural management practice for *Panicum dichotomiflorum* MICHX. were carried out at the Experimental Farm of Chungbuk National University from 1993 to 1995. Stratification of seed promoted emergence and plant establishment. Although fresh and dry yield at the 1st harvest were closely related with number of plants established per unit area, total yield was less affected by number of plants at the early stage. *P. dichotomiflorum* MICHX. could be harvested 3 times beginning 40~50 days after planting and fresh and dry matter yields were 90~120 tons• ha $^{-1}$ and 14~18 tons• ha $^{-1}$, respectively. Fresh and dry matter yields were significantly influenced by growth duration. The optimum seeding rate was 15 kg• ha $^{-1}$ when considering the 1st and 2nd harvest yields. Applications of nitrogen between 150kg•ha $^{-1}$ and 300 kg•ha $^{-1}$ did not affected fresh and dry matter yield significantly. Contents of crude protein, crude oil and crude ash were 16.3%, 20.0% and 11.5%, respectively.

KEY WORDS
Forage crop, genetic resources, productivity, native plants, biodiversity, forage quality

INTRODUCTION
Stable and year round supply of forage is important to reduce production costs and to grow healthy cattle. However, summer growth of the forage species currently cultivated in Korea is poor, therefore grazing and hay production is very limited. Utilization of wild plant resources is very promising for several reasons: no summer growth depression, high hay production, less pest and disease damage than introduced forage crops and general adaptation to Korean environmental conditions. Studies on the possible utilization of several native wild plants such as Perennial *Setaria chondrachne* Honda (Baek, 1986), *Dystaenea takeshimana* Nak. Kitagawa (Bang, 1974, Yang et. al. 1977), *Puccinellia coreensis* Honda(Kim et. al. 1994), and *Panicum dichotomiflorum* MICHX. (Jong and Cho, 1995) have reported in Korea. *P. dichotomiflorum* MICHX. is a annual grass introduced from North America a long time ago. Although *P. dichotomiflorum* is widely distributed in both arable land and wild habitat, it is hard to find a *P. dichotomiflorum* community in the wild. This is very a desirable characteristic of *P. dichotomiflorum* as a forage crop because it is poor a competitor as a weed in crop fields.

The objectives of the study were (i) to study the effect of seed stratification on plant establishment, (ii) to study the effects of planting date, seeding rate and amount of nitrogen on yield of *P. dichotomiflorum* as a forage crop.

METHODS
Both untreated seeds and stratified seeds which were buried outdoor from November 1992 to April 1993 were planted on April 9, 1993. To study the effect of planting date on yield, stratified seeds were planted on April 27, May 2, May 17 and June 2, 1994. In 1995 experiments, the effects of seeding rates (10 kg•ha $^{-1}$, 15 kg•ha $^{-1}$, 20 kg•ha $^{-1}$, 25 kg•ha $^{-1}$ and 30 kg•ha $^{-1}$) and nitrogen levels (150, 200, 250 and 300 kg N•ha $^{-1}$) on fresh and dry matter yields were studied. Planting occurred on May 12. In all experiments, seeding rate was 15 kg•ha $^{-1}$ (except seeding rate experiment), and total amounts of 250 kg•ha $^{-1}$ of N (except nitrogen level experiment), 200 kg•ha $^{-1}$ of P, 200 kg•ha $^{-1}$ of K and 10 tons•ha $^{-1}$ of manure were applied. One half of N and all of P and K were applied before planting and remainder of N was applied as a side dressing after harvesting. Row spacing was 0.3 m and a randomized complete block design with 3 replications was used in all experiments.

The first harvest occurred about one and a half months after planting followed by the subsequent harvests with the center 4 rows being harvests in all experiments.

RESULTS AND DISCUSSION
Stratification of seeds promoted emergence (Table 1). Although fresh yield was closely related with number of plants per unit area, the effect of plant number on fresh and dry matter yields was less at the later stage of growth. *P. dichotomiflorum* MICHX. could be harvested 3 times beginning 40~50 days after planting and fresh and dry matter yields were 90~100 tons •ha $^{-1}$ and 14~18 tons•ha $^{-1}$, respectively. Fresh and dry matter yields were significantly influenced by growth duration between harvests ($r = 0.771^{**}$ and $r = 0.802^{**}$, respectively). Leaf blade ratio was higher at earlier planting and/or harvesting.

Date of planting significantly affected fresh and dry matter yields (Table 2), but the yield difference among plantings which occurred before June was not great. Yields of the May 2 planting were less than those of April 27 or May17 planting due to poor establishment as a result of drought after planting. Only two harvests could be made from the June 2 planting.

Higher seeding rate increased fresh and dry matter yields of the 1st harvest (Table 2). The 2nd and 3rd harvests and total yields were not significantly different among seeding rates. Although seeding rate had no significant effect on fresh and dry matter yield, about 15 kg•ha-1 appeared to be suitable considering the yields of 1st and 2nd harvesting.

Nitrogen levels between 150 kg•ha $^{-1}$ to 300 kg•ha $^{-1}$ did not significantly affected fresh and dry matter yields (Table 2). Fresh yields of the 1st harvest ranged from 62 tons•ha $^{-1}$ to 70 tons•ha $^{-1}$, those of the 2nd harvest ranged from 41 tons•ha $^{-1}$ to 50 tons•ha $^{-1}$, but the yields of the 3rd harvests were much lower at less than 10 tons•ha $^{-1}$.

Contents of crude protein, crude fat, crude fiber and crude ash were 16.1%, 4.3%, 23.2% and 8.4%, respectively. Therefore, the quality of *P. dichotomiflorum* as a forage crop is comparable to other grasses such as orchardgrass, timothy and fescue.

Selection of lodging-resistant lines and effective weed control methods are two of the most important problems which should be solved before commercial cultivation of *P. dichotomiflorum* MICHX.

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Table 1
Effects of seed stratification and number of cuttings on the fresh and dry yields of *Panicum dichotomiflorum* MICHX. in 1993 experiment.

Seed treatment	Number of plants/m2	Fresh yield(tons/ha) 1st	2nd	3rd	Total	Dry yield(tons/ha) 1st	2nd	3rd	Total
'92 NT	187ab	34.5b	20.6b	16.2a	71.3	3.9b	3.6b	3.5a	11.0
'92T	292a	69.2a	21.7b	12.8a	103.7	8.3a	3.8b	2.6b	14.7
'91T	78b	49.5ab	32.7a	15.5a	97.7	5.9b	5.7a	3.1a	14.7
Average	186	51.1	25.0	14.8	90.9	6.0	4.4	3.1	13.5

NT = non-stratified seeds, T = stratified seeds
* Means in a column followed by the same letter are not significantly different at the 0.05 level.

Table 2
Effects of planting date, seeding rate and nitrogen level on fresh and dry yields of *Panicum dichotomiflorum* MICHX.

Treatment	Fresh yield (tons/ha) 1st	2nd	3rd	Total	Dry yield(tons/ha) 1st	2nd	3rd	Total
Planting date								
April 27	54.5	49.5	3.6	107.6a	6.6	10.0	1.2	17.8
May 2	44.8	38.0	3.5	86.3b	6.9	7.6	1.3	15.8
May 17	72.6	22.5	6.3	101.4a	11.8	4.0	2.1	17.9
June 2	50.8	6.4	-	57.3c	10.4	2.1	-	12.5
Seeding rate								
15kg/ha	39.1b	45.8a	6.8a	91.7a	4.5c	7.3a	2.8a	13.8a
20kg/ha	47.6ab	43.7a	4.9a	96.2a	5.3b	7.4a	1.6a	14.3a
25kg/ha	54.1a	40.3a	5.8a	1002.2a	6.1ab	6.7a	1.6b	14.1a
30kg/ha	56.2a	39.0a	6.4a	101.5a	6.3a	7.3a	1.8a	15.4a
Nitrogen levels								
150kg/ha	61.6a	41.3a	8.7a	111.6a	6.3a	8.8a	2.4a	16.8a
200kg/ha	61.7a	45.8a	7.4a	114.9a	6.4a	9.0a	2.0a	17.4a
250kg/ha	68.5a	46.7a	7.1a	122.2a	8.4a	8.3a	2.0a	18.7a
300kg/ha	69.7a	50.1a	5.5a	124.3a	7.1a	9.0a	1.5a	17.6a

*Means in a column followed by the same letter are not significantly different at the 0.05 level.