Influence of Organic and Inorganic Top Dressing Fertilization on Production Characteristics of Ruzi Grass (*Brachiaria ruziziensis*) in Thailand

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**ABSTRACT**

This experiment was aimed to investigate the production characteristics and nutritive quality of Ruzi grass by varying levels of organic and inorganic fertilizer viz. cow dung (CD) and urea fertilizer (UF), respectively. The treatments were arranged into a factorial design and grouped according to a completely randomized design with three replications. Three doses of CD (0, 25, 50 and 100 kg/ha) were applied at sowing and four UF doses were applied as top dressing (0, 25, 50 and 100 kg/ha). The application of CD and UF have a positive effect on the length of leaves (p<0.00 and p<0.02) but their interactions are not significantly different (p=0.12). The effect of CD, UF and their interaction significantly increased the number of leaves (p<0.00), the number of tillers (p<0.00) and dry matter yield (p=0.00). There were no significant effect of CD and interaction on the leaf/stem ratio (p=0.17 and p=0.23, respectively) but UF slightly increased the ratio (p=0.00), CP% (p<0.00), NDF% (p>0.00) and ADF% (p<0.00). The best combination of fertilizer could be noted at 50 kg/ha UF and 10 t/ha CD to obtain better results. It might recommend that better fertilizer management can improve productivity as well as the nutritional quality of Ruzi grass.

**Key words:** Cow dung, Nutritive quality, Production characteristics, Ruzi grass, Urea.

**INTRODUCTION**

Ruzi grass (*Brachiaria ruziziensis*) is a forage crop that is grown throughout the humid tropics. It was originated from Africa (Pongtongkam *et al.*, 2006) but distributed mainly in Zaire or Congo. It was grown in Thailand for the first time in 1968 at Thai-Denmark Dairy Farm, Saraburi province and at Pak-Chong Animal Nutrition Research Center, Nakhon Ratchasima province (Jamsavad, 1994). Ruzi grass has good drought tolerance. It eliminates weeds and is useful for erosion control in areas where it grows well, but needs good drainage. Besides, it responds well to nitrogen, both from inorganic and organic sources (Martens *et al.*, 2012). The nitrogen fertilizer can effectively be used to increase the productivity of the forage in the pastures.

Sandy soils are a crucial characteristic of Northeast Thailand, cover 80% of its area (Clermont-Dauphin *et al.*, 2010). The alluvial plateau of the Korat basin makes up a huge percentage of Northeast Thailand, with highland soils encompassing 37% of the region's area (Wongwwatchai and Paisancharoen, 2002). The topography of the alluvial plateau is undulating, creating a series of mini-watersheds. Farmers in the northeast have transformed the bottoms of mini watersheds into paddies for rice and plant sugarcane and cassava in the plateaus. The type of weather in Northeast Thailand is categorized by diverse dry and wet seasons. Commencing November to April, just about no rain falls in this region. The above characteristics have created a complex management challenge for farmers. First, sandy soils have poor water-holding ability i.e. in the rainy season, they spread saturation rapidly and joint with their low fertility status decreases the crop production options. That is why fodder production becomes harder in that soil. For these, the full picture of the fodder production is tough in that type of land. These conditions might traditionally have been disadvantageous for agricultural development. Saline soils at present occupy an area of almost 17% of the region and are increasing per annum. Maximum saline soils are correspondingly sandy; these saline sandy soils can be damaging to plants and results in low yield, due to low fertility, high soluble salts particularly sodium chloride, low water-holding ability and low cation interchange capacity.

However, it is the major livestock region in Thailand (Hare *et al.*, 2009). The dairy farmers in Thailand are
interested to improve the quality of their pastures to have an advantageous milk production (Tekletsadik et al., 2004) and Ruzi grass is one of the most available grass to feed the dairy animals (Tudsi et al., 2002 and Hare et al., 2009). Some previous investigations have been conducted on liquid manure application to soil and its effects on crop growth, yield, composition and soil properties (Schils et al., 2003 and Rusinamhodzi et al., 2013). However, to best of our knowledge, studies that assess the response of growth characteristics and dry matter production of Ruzi grass under organic fertilizer cow dung (CD) and inorganic urea fertilizer (UF) application is yet to be done. According to Calonego et al. (2013) and Garcia et al. (2013), Ruzi grass has a valuable nutrient recycling activity and enhances soil properties. It was reported to decrease soil phosphorus (P) fixation through acid phosphatase activity and the promotion of P-metabolizing microorganisms. Thus, enhances soil P availability for the next crops (Janegitz et al., 2013).

Considering the above facts, the present study was aimed at assessing the production, nutritional quality, chlorophyll content of Ruzi grass and soil properties in response to different levels of CD and top dressing UF application. This might be the first step in Northeast Thailand for enhancing the exploitation of the potential plenty available CD for increasing productivity of Ruzi grass as well as improving the soil health. This is also important for elsewhere where the prevailing conditions are the same.

**MATERIALS AND METHODS**

**Experimental site**

The study was conducted at the Fodder Land of Animal Science Farm, Kasetsart University, CSC, Thailand. The geographical location of the site is between 17° 23' 20” N and 103° 43’ 17” E. The chemical analyses of the grass were conducted at the Animal Science Laboratory, Kasetsart University.

**Experimental design and cultivation practices**

It was a 3 × 4 factorial experiment, where, three doses of CD (0, 5 and 10 t/ha) were applied before sowing of the Ruzi grass and four UF doses (0, 25, 50 and 100 kg/ha) were applied as topdressing after the first cutting (30 days after sowing). The control group (0, 0) was treated as zero fertilization. The CD used was obtained from the Beef Cattle Farm, CSC, Thailand. The land was plowed twice followed by harrowing once and divided into 12 plots (3 m × 3 m per plot). The grass cutting was transplanted into that plot with 30 × 30 cm spacing. The cuttings containing the rooting nodes were planted in June 2017 (beginning of the rainy season). The planted stem cuttings/rhizomes of about 10 nodes were planted in June 2017 (beginning of the rainy season). The tillers were counted as soon as they presented a fully expanded leaf with a visible ligule, while the new leaves were also counted when they presented a visible ligule. The tillers were marked with plastic-coated wires and inert ink used for identification of the leaves. Approximately eight days after the first cutting (30 days), chlorosis was observed in young leaves, accompanied by narrow dark green bands. Chlorophyll concentration was determined by using a portable Chlorophyll Meter (model SPAD-502, Soil and Plant Analysis Development of Minolta Co. Ltd., Osaka, Japan). The device has two LEDs positioned at the tip of the meter, which emit light in the range of 600-700 nm and 860-1060 nm. The values obtained in the display (SPAD value) are proportional to the amount of chlorophyll present in leaves (Argenta et al., 2001). Readings were taken early in the morning, in the shade to avoid the effect of direct sunlight on the chlorophyll, always in the middle of the leaf, avoiding necrotic areas by the attack of pests and diseases and the edge of the leaf (Silva, 2012). The leaf/stem ratio was determined using the dry mass production data of the leaf and stem fractions.

**Proximate components**

To assess the nutritional quality of the Ruzi grass, proximate components of the grass were analyzed at 2nd cutting (day-60). Each of the analyses was repeated for three times. Dry matter of leaf and stem was determined by drying at 60°C for 72 hours (three days) in a drying oven (Universal Oven UF30plus, Memmert, Germany). Dried samples were then ground with a mill (Micro hammer mill, Kinematika, USA) to pass a 1 mm sieve and kept at room temperature for chemical analysis. Total nitrogen was determined by micro Kjeldahl method (AOAC, 1995) and 6.25 was used as a conversion factor. Neutral Detergent Fiber (NDF) content was determined as described by Van Soest et al. (1991). Neutral detergent solution [60 g sodium lauryl sulphate; 37.22 g disodium dihydrogen EDTA; 13.62 g sodium borate (decahydrate); 9.12 g disodium hydrogen phosphate; 20 ml 2-ethoxy-ethanol; Adjust pH 6.9-7.1 and 2 L distilled water] In brief, 1 g sample was taken in 600 ml Berzelius beaker and added 100 ml of neutral detergent solution and 0.5 g sodium sulphite, boiled for one hour. Rinsed the crucible with hot water and acetone then dried at 105°C overnight and made ash at 550°C for three hours. Acid Detergent Fiber (ADF) contents were determined according to the procedure described by Robertson and Van Soest (1981). Acid
detergent solution [20g cetyl trimethylammonium bromide (CTAB) and 1L of 1.0 N sulfuric acid] was used and the rest procedure was similar to NDF. Acid detergent lignin (ADL) contents were determined using the AOAC method (2002) in which the ADF residue is treated with 72% sulfuric acid: 735 ml concentrated sulfuric acid (98%) diluted with 265 ml distilled water.

**Statistical analysis**

Analysis of variance (ANOVA) for factorial design was done by Minitab 17 (version: 17, Minitab. Inc., State College, Pennsylvania, USA). Tukey test was used for mean comparison.

**RESULTS AND DISCUSSION**

The variables concerning the yield and quality characteristics of the Ruzi grass are summarized in Table 1, 2 and 3 to elucidate the impacts of CD, UF, top dressing and their interaction effect on them, respectively.

**Effect of organic and inorganic fertilizer on the production characteristics**

**Length of leaves**

The CD and UF independently affects significantly the length of the leaves (p=0.000 and p=0.020, respectively) but their interaction did not (p=0.120). The highest leaf length was found 23.67 cm in 10 t/ha CD plot and 23.07 cm in 100 kg/ha UF plot. The leaves length in 50 kg/ha UF plot was found similar (p=0.050) to all other three doses of UF.

**Number of leaves**

The effect of CD, UF and their interaction were found significant (p=0.000) in the number of leaves. The fodder plot with 10 t/ha CD yielded 57 more leaves than that of the plot without any dung, while, the 5 t/ha plot was found similar to both of them (p=0.050). With regards to UF top dressing, 50 and 100 kg/ha UF plot differed non-significantly (p=0.050) between them which was also found same between the 0 and 25 kg/ha UF plot. However, the two higher doses of UF gave 52-63 more leaves compared to that of the two lower doses of the UF (p=0.000). In respect to the interaction between the UF and CD, 100 kg/ha and 10 t/ha combination ranked highest with 202 leaves which was followed by 100 and 5 (12 leaves less), 50 and 10 (15 leaves less) and the lowest number of leaves was found 71 in 0 and 0 combination.

**Number of tillers**

Main effects of CD, UF and, combined effect of them were found to have a significant effect on the number of tillers of the Ruzi grass (p=0.000). The highest tiller numbers (76) were found at 10 t/ha CD which was double of the control group and it was 23 more tillers than that of the 5 t/ha group. The UF doses showed same pattern of results like the number of leaves, made two similar sets viz. 0 and 25 kg/ha vs. 50 and 100 kg/ha and the later had 6 more tillers (p=0.000) than that of the first one. In interaction effect, at 10 t/ha CD, the number of tillers increased significantly with the increase of UF level.

**Plant height**

The tallest plant was found in 10 t/ha CD group (55 cm) which was 3 and 11 cm taller than that of the 5 t/ha and 0 t/ha CD group (p>0.050 and p=0.000, respectively). As per the UF level is concerned, the highest value was found at 100 kg/ha (55 cm). Plant height in 25 kg/ha and 50 kg/ha level of UF differ non-significantly (48 - 50 cm; p>0.050) and both of them were found similar to the lowest and highest level of UF (p=0.050). However, the difference in plant height between the 0 and 100 kg/ha UF was 7 cm and this difference was found significant (p = 0.030). The interaction of CD and UF had significant effect on the plant height (p=0.000). The tallest plants were of 59 - 61 cm (in 100-5 and 100-10 combination, p<0.050). The plants height showed a significantly decreasing trend with the decrease of UF level at 5 and 10 t/ha CD and as obvious, the 0-0 combination of CD and UF gave the least value.

**Dry matter yield**

The dry matter production of Ruzi grass showed that there was a significant effect of CD on DM yield (p=0.000). The

**Table 1:** Effect of cow dung on different production characteristics and nutritive quality of Ruzi grass.

| Parameters          | Different levels of cow dung (t/ha) | P-value |
|---------------------|-------------------------------------|---------|
|                     | 0        | 5       | 10      |
| Length of leaves (cm)| 16.74± 2.59 | 19.49± 2.54 | 23.67± 1.52 | 0.000 |
| Number of leaves     | 115.4± 38   | 146.58± 32.11 | 171.58± 23.99 | 0.000 |
| Number of tillers    | 38.35± 2.01  | 53.13± 2.56   | 75.97± 7.75   | 0.000 |
| Plant height (cm)    | 43.50± 2.07  | 52.14± 5.09    | 55.22± 3.91    | 0.000 |
| Leaf : Stem          | 1.54 ± 0.41   | 1.58 ± 0.39    | 1.65 ± 0.359   | 0.170 |
| DM yield (t/ha)      | 11.72± 1.04   | 12.53± 1.4     | 15.55± 0.97    | 0.000 |
| CP (% DM)            | 6.90± 0.98    | 7.50± 0.92     | 8.70± 1.23     | 0.000 |
| NDF (% DM)           | 58.70± 5.38   | 55.20± 4.93    | 51.70± 5.16    | 0.020 |
| ADF (% DM)           | 25.22± 3.1    | 22.30± 2.95    | 21.40± 2.46    | 0.050 |

Mean ± SD. Means that do not share a letter are significantly different (p ≤ 0.05). DM = Dry matter, CP = Crude protein, NDF= Neutral detergent fiber, ADF= Acid detergent fiber.
Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Maleko et al., 2015).

The result revealed that each succeeding increase in the CD was culminating in the increased number of tillers. By increasing the rate of CD there was a rapid increase in the number of tillers. It was noted that the CD increases the tillering rate of the Ruzi grass during the vegetative phase.

### Table 2: Effect of urea on different production characteristics of Ruzi grass.

| Parameters                | Different levels of urea (kg/ha) | P-value |
|---------------------------|----------------------------------|---------|
|                           | 0                  | 25       | 50       | 100      |
| Length of leaves (cm)     | 18.49±3.82         | 18.82±3.53| 19.44±2.82| 23.07±2.75| 0.020  |
| Number of leaves          | 113.4±36.5         | 118.0±24.37| 165.33±15.67| 181.33±22.58| 0.000  |
| Number of tillers         | 53.22±13.59        | 52.38±14.61| 58.20±17.62| 59.49±20.59| 0.000  |
| Plant height (cm)         | 47.53±5.24         | 48.06±3.97| 50.40±5.50| 55.16±7.67| 0.030  |
| Leaf : Stem               | 1.15±0.35          | 1.69±0.24 | 1.30±0.30 | 1.89±0.16 | 0.000  |
| DM yield (t/ha)           | 8.41±1.04          | 12.53±1.4 | 21.82±0.84| 24.61±0.94| 0.000  |
| CP (%) DM                 | 7.52±1.05          | 8.29±0.98 | 8.50±0.87 | 9.23±1.00 | 0.010  |
| NDF (%) DM               | 56.20±6.21         | 52.50±5.9 | 50.32±5.33| 51.10±4.98| 0.000  |
| ADF (%) DM               | 27.20±2.09         | 23.20±2.22| 22.70±3.46| 22.60±2.98| 0.050  |

Mean ± SD. Means that do not share a letter are significantly different (p ≤ 0.05). DM = Dry matter, CP = Crude protein, NDF = Neutral detergent fiber, ADF = Acid detergent fiber.

Application of 5 t/ha and 10 t/ha CD resulted in 3% More yields, respectively over the control group. The DM yield in 100 k/N CD UF application was 3 and 2 times of the 50 and 25 kg/ha group, respectively and was 5 t/ha more than that of the 50 kg/ha UF group and all of them differ significantly (p<0.000). However, there was no significant difference among the interaction effect of UF and CD (p=0.740).

**Leaf/stem ratio**

The result revealed that there was no significant effect of CD alone and interaction of CD and UF on the leaf/stem ratio (p=0.170 and p=0.023, respectively). But UF level has a significant effect on leaf/stem ratio (p=0.000). The best ratio was found at 100 kg/ha and 25 kg/ha UF which was 1.89 and 1.69, respectively (p<0.05).

**Effect of organic and inorganic fertilizer on the nutritive quality of Ruzi grass**

The result stated in Tables indicates that the level of CD, UF and interaction of CD and UF had a significant effect on CP% (p=0.050), NDF% (p=0.050) and ADF% (p=0.050). The highest CP% value was 8.7%, found at 10 t/ha CD and 1.2% and 1.8% more than that of the 5 t/ha and 0 t/ha CD group, respectively (p>0.050 and p=0.000, respectively). The NDF% and ADF% were found lowest at the same rate of CD (p=0.020 and p=0.050, respectively). The best CP value (9.23%) was found at 100 kg/ha UF level which was 9-23% higher than that of the rest three groups (p=0.01) who among them differ non-significantly (p>0.05). The lowest NDF% was found at 50 kg/ha and 100 kg/ha UF level while the lowest ADF% found at 25, 50 and 100 kg/ha UF level (p<0.050). The best interaction result obtained from 50 kg/ha UF and 10 t/ha CD in which CP= 9.88%, NDF=52% and ADF=20%.

**Effect of organic and inorganic fertilizer on the production characteristics**

The results showed that the leaf length of Ruzi grass is significantly increased by an increasing rate of CD and UF. According to Maleko et al. (2015), CD application was found non-significant on leaf length of Ruzi grass in the tropical sub-humid environment in Tanzania. This finding is also reported in the earlier study that states that the application of nitrogen nutrients tends to stimulate the growth of some grass yield components and with a likelihood of reducing others especially when the competition is induced (FAO, 2014). This result is contradictory to our findings. However, during this study, the experimental site-specific environmental factors such as sunlight hours, soil and air temperature were not recorded and these factors may affect the growth pattern of Ruzi grass. The observed influence of fertilizer on leaf production was gradually increased from the first cut to the second cut that could be subjected to the fact that nutrients were now available and the plant was inducing the growth of different organs including leaves. The lower rate of CD fails to influence the leaf numbers might be attributed to the maturation of CD in which at the early stage mineralization was still slow and hence few nutrients were available to influence the leaf production. While in the later stages leaf growth was quicker may be due to the greater mineralization rates from CD where plants invested more in photosynthesis (Maleko et al., 2015). Concerning the number of leaves, the differences were observed between the UF levels. The number of leaves increases due to variation in the emergence of the leaves of the grasses fertilized with UF is related to the direct effect that nitrogen has on the flow of cells within the meristematic region (Paiva et al., 2012). According to Silveira et al., (2010), to the genetic characteristics of Ruzi grass, because the number of leaves is genetically determined and is conditioned by environmental variations, with the prominent effects being related to temperature and nitrogen level. It can be notified that the Ruzi grass which is treated with UF reach their maximum number of leaves sooner than those are not fertilized and/or little amount of fertilizer (Paiva et al., 2012).

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Table 3: Combined effect of urea and cow dung on production characteristics and nutritive quality of Ruzi grass.

| Parameters                           | 0.0     | 0.5     | 1.0     | 2.0     | 5.0     | 10.0    | 50.0    | 100.0   | P-value |
|--------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Interaction between different levels of Urea (kg/h) and Cow dung (t/h) | 25.0    | 50.0    | 100.0   | 25.0    | 50.0    | 100.0   | 25.0    | 50.0    | 100.0   |

Note: DM = Dry matter, CP = Crude protein, NDF = Neutral detergent fiber, ADF = Acid detergent fiber.

In our study, CD increased the DM yield of 7% and 25% over the control group by treating accordingly with 5 t/h and 10 t/h. This result also coincides with the increase in the number of tillers and leaves, which contributed to the production of the forage mass. Ruzi grass's DM yield of 11.1 t/h without fertilizer and 27.0 t/h, when fertilized with 600 kg N/ha/year, is reported in Gualaca, Panama (FAO, 2014). The increase in the dry matter production in pastures may be due to the rapid uptake of fertilizer especially N and increased plant growth (Sun et al., 2008). The linear increase in the dry matter production of Ruzi grass, as a function of the fertilizer, can be explained by the fact that tropical forage needs nitrogen in large quantities as a result of the deposition during cell division (Freitas et al., 2012). In this study, the supply of 100 kg/h UF produced two times more (24.61 t/h) in the dry matter production than the control group (8.41 t/h). This result can be attributed to response to the N rate and the application period to concur with the peak absorption by the residual N from the previous fertilization which is supported by Islam and Garcia, (2012). In the interaction of fertilizer, the highest but a slight decline in the reproductive phase (Wongsuwan, 1999). The result of this study demonstrated that the number of tillers of the Ruzi grass indicated that an inadequate amount of UF resulted in reduced tillers and increased and increased UF levels increased tiller numbers which are inclined with the findings of Langer, (1963). The nitrogen fertilizers influence the activation of dormant buds and accelerate the tissue flow in individual tillers, increasing the turnover of leaves and tillers, which favor the production of forage. However, the available N is substituted from the previously treated organic matter. As per the demand of the grass is concerned, it is crucial to adapt the available N from CD applied and the N from UF, (Halvorson et al., 1999). Thus, it is necessary to estimate the total N budget required for cultivating a certain crop/grass that could be met from CD/organic matter and UF as well. The results indicate that there was a noticeable increase in plant height over the control group. The observed differences in plant height are attributed to the release of the nutrients from the CD and their subsequent assimilation by plants for their growth. The peak nutrient decomposition and release of various essential nutrients from compost manure under sandy loam soils were observed at 20 weeks (Essè et al., 2001). The result can be supported by a study on composts manure which revealed that only 1 to 8.2% of total added carbon was mineralized after 28 days (Hebert et al., 1991). Hence, the observed effect of CD on plant growth of Ruzi can be subjected to an increase in the availability of essential growth nutrients from the CD applied that were slowly released the nutrient in the soil by microbial decomposition. The result revealed that plant height was gradually increased by the increasing rates of UF. It can be mentioned that the nutrient mainly responsible for plant growth is N fertilizer, the highest plant height obtained from a higher dose of UF but there is a lag period of nutrient availability which results in a slow growth initially (Batista., 2011).
DM yield found at 50 kg/h UF with any rate of CD which can be attributed to fact that increased rate of fertilizer (more than 50 kg/ha UF) could not show better result because of the sufficiency of the nutrients in the soil. It can be extracted from the result that there is no interaction between the rates of CD, UF and their combination on leaf/stem ratio. Therefore, the lack of significant differences in leaf/stem ratio is due to the acceleration in the growth rate by treating with the nitrogen fertilizers and natural composts from CD. The main limiting factor for the slower growth at the early stage was the nutrient deficiency in the soil as the CD had not been fully decomposed. But there was a contrary situation in the later stage of production of Ruzi grass and slowly increases the leaf/stem ratio by increasing the rates of CD (Table 3). The leaf/stem ratio of Ruzi grass did not differ linearly with different UF levels. But the increased application of nitrogen fertilizer increased the ratio (Table 1). There is a slight increase in the leaf/stem ratio over the control group. However, the result revealed that the leaf/stem ratio at 25 kg/h is higher than the 50 kg/h, the cause for this is unknown. These results emphasize that UF fertilization should be monitored systematically (Sun et al., 2008). Besides, there was no interaction of CD and UF on the leaf/stem ratio. At every combination of fertilizer, the ratio was the same within the range of 1.5 to 1.6 (Table 3). This circumstance can be subjected to the pattern of development of leaf and/or stem is linear (Lambers et al., 1992).

**Effect of organic and inorganic fertilizer on the nutritive quality**

The results showed that the CP content was similar in first two doses of UF and the values are close to the control. With the nutritive quality of Ruzi grass the CP was highest with the highest rate of CD as well. However, there was no significant difference on CP content in terms of the UF and the highest rate of CD. This result was similar to the study of Buakaew et al., (2000). They worked with Koronivia grass (Brachiaria humidicola) and stated that the application of CD significantly increased CP content from 5.00 to 6.52%. This result suggested that soil N derived from CD could significantly increase CP content from 5.00 to 6.52%. This can be concluded as to grow Ruzi grass successfully in poor-nutrient soil, the fertilizer management is much important.

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