GMU19:3:19 and GMU18:3:18: Two New Fertilizer Formulations Enhanced Quality of Tifdwarf Golf Green

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INTRODUCTION

Managing golf greens to make it into a championship condition is a dream of most golf superintendents. Golf greens are mowed daily, so the leaf areas reduced to certain percentage depending on the height and the variety. Such turf is normally under stress and it needs certain treatments to make it able to grow at normal rate.

Beside many other management requirements, the use of right fertilizer is one the most critical practice in managing a golf-green.

The present study was undertaken to evaluate the effectiveness of 4 new fertilizers to enhance growth and ground cover of Tifdwarf turf on golf green under mowing practice

MATERIALS AND METHODS

Location of study

The trial was conducted at the Turf Unit, Taman Pertanian Universiti, Universiti Putra Malaysia using the existing field grown with Saujana Tifdwarf. The field is equipped with sprinkler irrigation system.

Fertilizers

Two new fertilizers (GMU 19:3:19 and GMU 18:3:18) and two commercial fertilizers (Best Greens Kote 18:3:18 and Lesco Elite 20:2:16) and a control (no fertilizer) were used in the study. The names of the fertilizers are

A = GMU 19:3:19
B = Best Greens Kote 18:3:18
C = Lesco Elite 20:2:16
D = GMU 18:3:18
O = no fertilizer - control

Experimental design

The experiment was laid out in a randomized complete block design (RCBD) with four replications (Figure 7). There were 20 plots (5 fertilizers (4 fertilizer types + 1 control) x 4 replications)) with a size of 2 m x 3 m each. The total size of the experimental plot was 120 m^2.

Agronomic practices

The experimental plot was maintained according to normal practices applied on golf course greens. They were irrigated daily for 10 minutes. Fertilizer application was done every two weeks at the rate of 4.88 g

N/m^2/month or equivalent to 29.2 g N/plot/month. The same rate was used for all the four fertilizer types. Weeding and pest control was done manually whenever necessary. Mowing at 5 mm was done daily in the morning.

Data Collection

Clipping Fresh Weight (g/4m^2)

Total clipping weight was measured by weighing all the leaves mowed in a 2 m x 2 m area of each plot. Data were taken weekly.

Clipping Dry Weight (g/4m^2)

The total weight of the mowed leaves from above were oven dried at 100^{o}C for 2 days or until no further weight loss to remove all the water. Data were taken weekly.

Turf (Leaf) Color

The turf color appearance was scored visually based on green color intensity using the following code:

1 = less green to 9 = darkest green

It was done daily after mowing.

Shoot Density

The number of shoots in a 5 cm x 5 cm quadrate. Two (2) random quadrate samples were taken in each plot. Data were taken once in two weeks before mowing.

Leaf Length (mm)

The average length of all unclipped leaves inside 2 randomly sampled 5 cm x 5 cm quadrates. Data were taken once in every two weeks before mowing.

Leaf Width (mm)

The average width of all unclipped leaves inside 2 randomly sampled 5 cm x 5 cm quadrates. Data were taken once in every two weeks before mowing.

Internode Length (cm)

The average length of all internodes of stolons inside 2 randomly sampled 5 cm x 5 cm quadrates. Data were taken once in the 8th week.

Shoot Fresh Weight (g/100cm^2)

The average total weight of fresh shoots in two 10 cm x 10 cm quadrates randomly sampled from each plot.

Shoot Dry Weight (g/100cm^2)

The average percent dry matter content of shoots in two 10 cm x 10 cm quadrates randomly sampled in each plot. The total shoot fresh weight were oven dried at 100^{o}C for 2 days or until no further weight loss to remove all the water. Data were taken once in the 8th week.

Root Fresh Weight (g/100cm^2)

The average total weight of fresh roots in two 10 cm x 10 cm quadrates randomly sampled in each plot.

Root Dry Weight (g/100cm^2)

The average percent dry matter content of roots in two 10 cm x 10 cm quadrates randomly sampled in each plot. The total root fresh weight were oven dried for at 100^{o}C for 2 days or until no further weight loss to remove all the water. Data were taken once in the 8th week.

Data Analyses

Two-way analysis of variance was conducted to detect differences among the fertilizers for all the characters studied. Mean for all characters studied between the fertilizers were compared using Tukey test at p=0.05.

RESULTS

The experiment was laid on an existing field that has been fertilized using different fertilizer type and rate. Thus the initial (1st and 2nd week) fertility status of the plot was slightly higher. Fertilizer application for the trial was started on the 0 week and followed by the 2nd, 4th and 6th week and data taking started one week later. Thus, the soil fertility status for the 1st, 3rd, 5th and 7th week should be slightly different as compared to the fertility in the 2nd, 4th, 6th and 8th week.

In general, anova showed that fertilizer application significantly increased the green color intensity, number of shoots per unit area and dry weight of both shoot and roots (Figures 1, 2, 5 and 6). There were no differences in leaf leaf length, leaf width and internode length (Figures 3 and 4). However, there were slightly higher clipping fresh weight and the clipping dry matter content in the 1st and 2nd week probably due to the initial high fertility status.

EFFECTS OF GMU 19:3:19

The fertilizer A (GMU 19:3:19) significantly enhanced the green color intensity of the turf followed equally by fertilizers B (Best Green Kote 18:3:18) and C (Lesco Elite 20:2:16). Without fertilizer, as expected, the turf significantly became brownish in color (Figures 7 and 8).

Beside the color, the application of GMU 19:3:19 also increased clipping fresh weight, clipping dry weight, shoot density, shoot and root fresh and dry weight. However, there were no differences in the leaf texture.

The internode length of turf fertilized with GMU 19:3:19 was slightly shorter, but not statistically significant, as compared to those fertilized by the other fertilizers or even as compared to the control (Figure 4).

Apparently the application of GMU 19:3:19 enhance dwarfing, stimulate more dry matter production in both roots and shoots that make the turf stronger, and enhanced green color in the leaves indicating the presence of more chlorophyll.

EFFECTS OF GMU 18:3:18

Generally, GMU 18:3:18 produced comparably similar effects as the other fertilizers but slightly inferior to GMU 19:3:19. However, it induced higher production of root dry weight which is very crucial to make the turf stronger and hardy.

The effect on turf color was comparable with the other fertilizers but it was still within the acceptable color (score >6) for a good golf green.

The leaves of GMU 18:3:18 fertilized turf was slightly bigger in size and the shoot density was significantly higher that the other fertilizers but slightly lower that the superior GMU 19:3:19.

DISCUSSION AND CONCLUSION

Good golf green normally refers to those with high density coverage and greener in color. In order to obtain such quality green, beside the variety, it is necessary to have a management practice that will enhance growth vigor with high dry matter production, more shoot production and such turf will eventually also produced much greener in color.

In this study, the fertilizer GMU 19:3:19 was the best as compared to the other three fertilizers. Application of GMU 19:3:19 increased the dry matter contents of both shoots and roots as evidenced by the increased in clipping weight and root dry matter rather than leaf sizes. This indicates that the turf became more vigorous, produced many shoots and stronger root system and green in color. Turfs with such characteristics are more resistant to stress conditions. All fertilizers were applied using the same rate and time. The differences in the effects on the turf quality were mainly due to the composition of the fertilizers.

The GMU 18:3:18 is the second best. Turf fertilized with GMU 18:3:18 produced stronger roots as indicated by the high root dry matter, bigger leaves and slightly higher shoot density. Other effects were similar to the other commercial fertilizers.

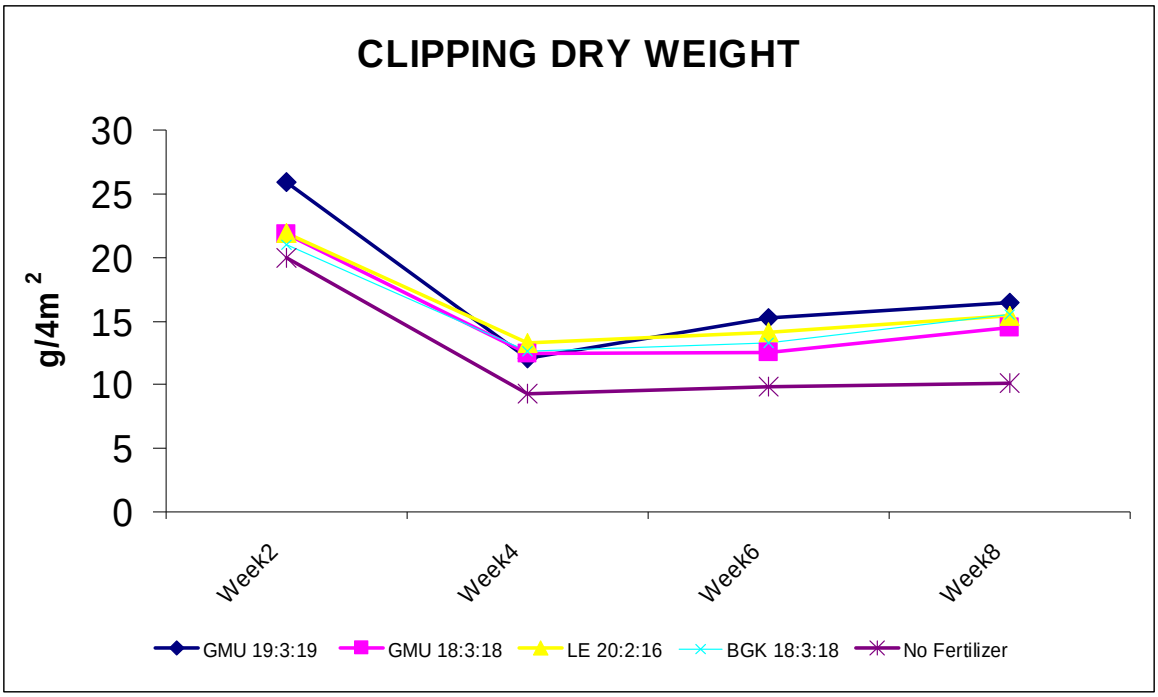
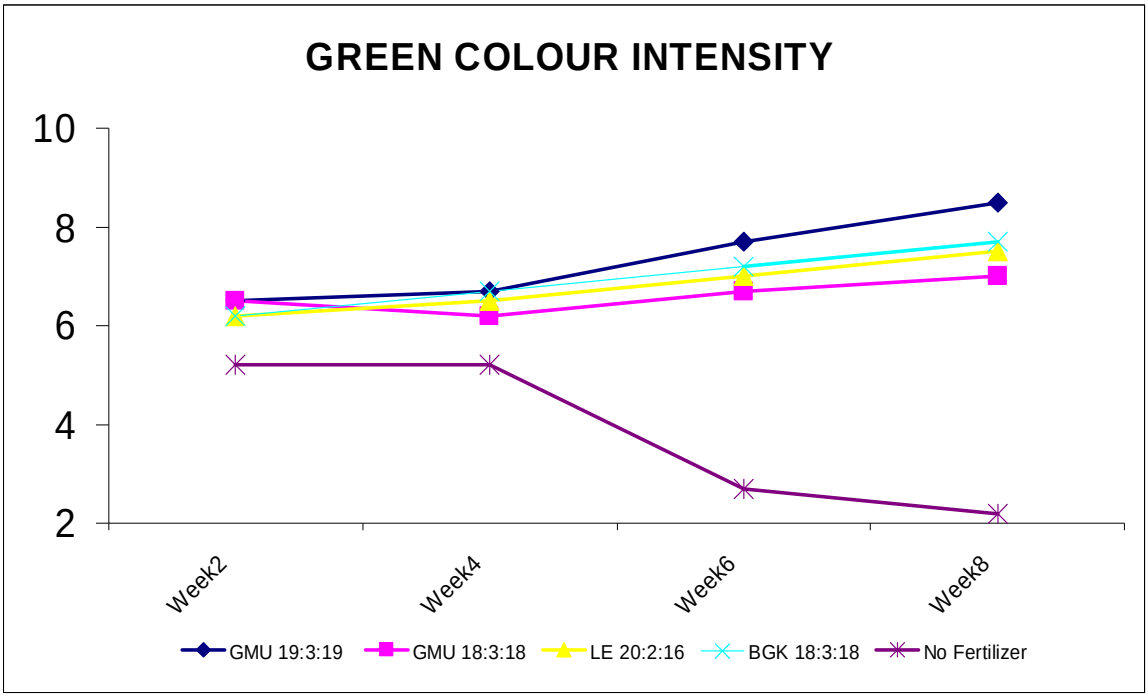


Figure 1. Means of clipping dry weight (g/4m^2) of bermuda tifdwarf mowed at 5mm and fertilized with 4 different types of fertilizers at the rate of 4.88 g N/m^2/month and applied in two split applications at every two weeks.



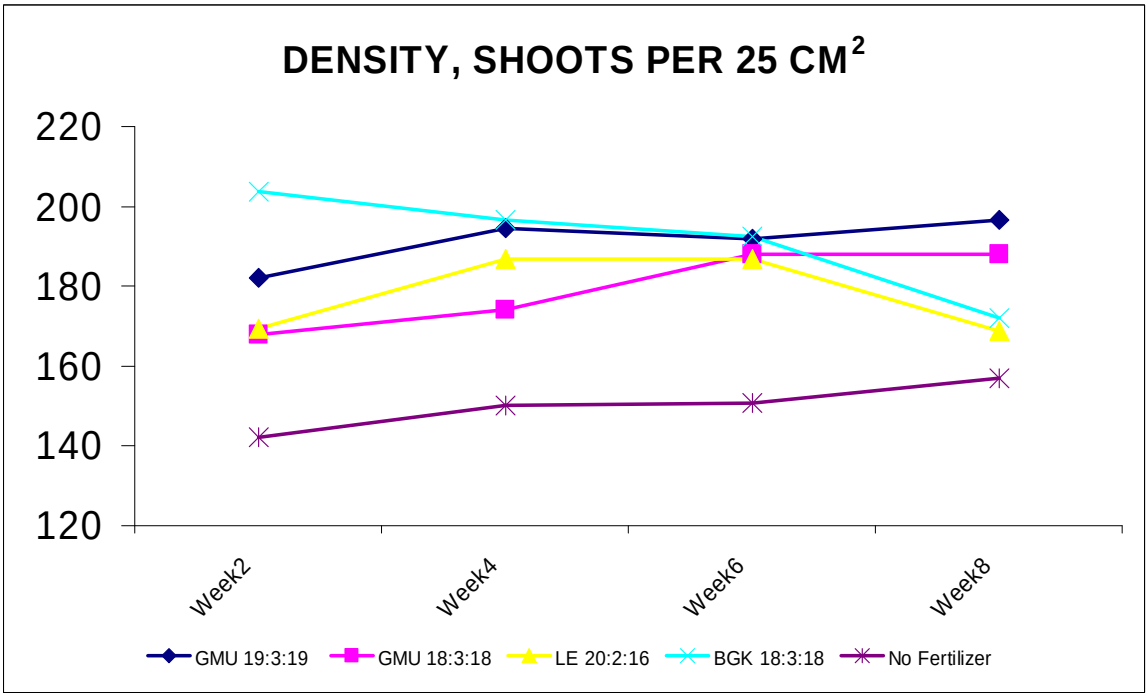
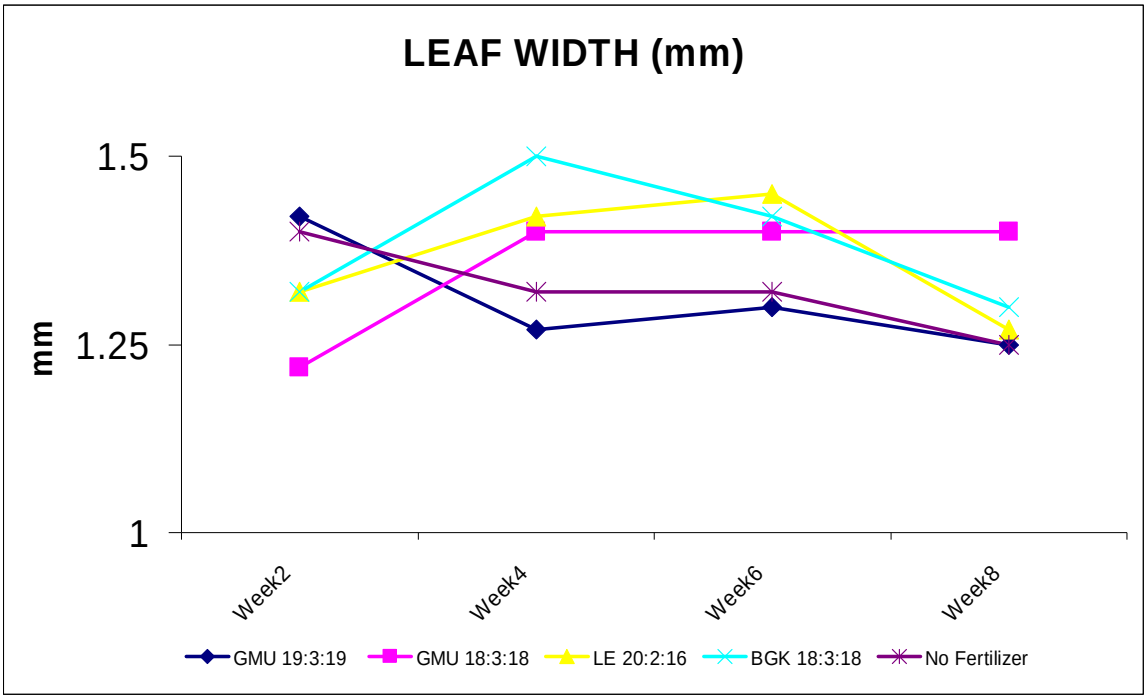


Figure 2. Means of green color intensity and shoot density (shoots/25 cm^2) of bermuda tifdwarf mowed at 5mm and fertilized with 4 different types of fertilizers at the rate of 4.88 g N/m^2/month and applied in two split applications at every two weeks.



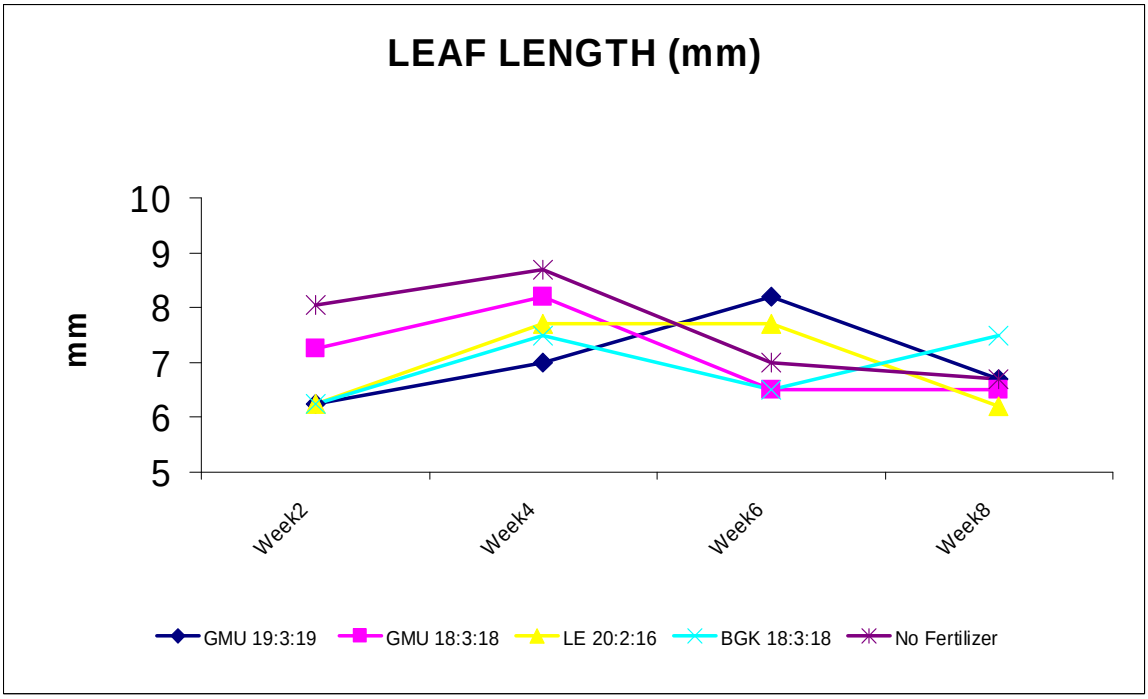


Figure 3. Means of leaf width and leaf length of bermuda tifdwarf mowed at 5mm and fertilized with 4 different types of fertilizers at the rate of 4.88 g N/m^2/month and applied in two split applications at every two weeks.

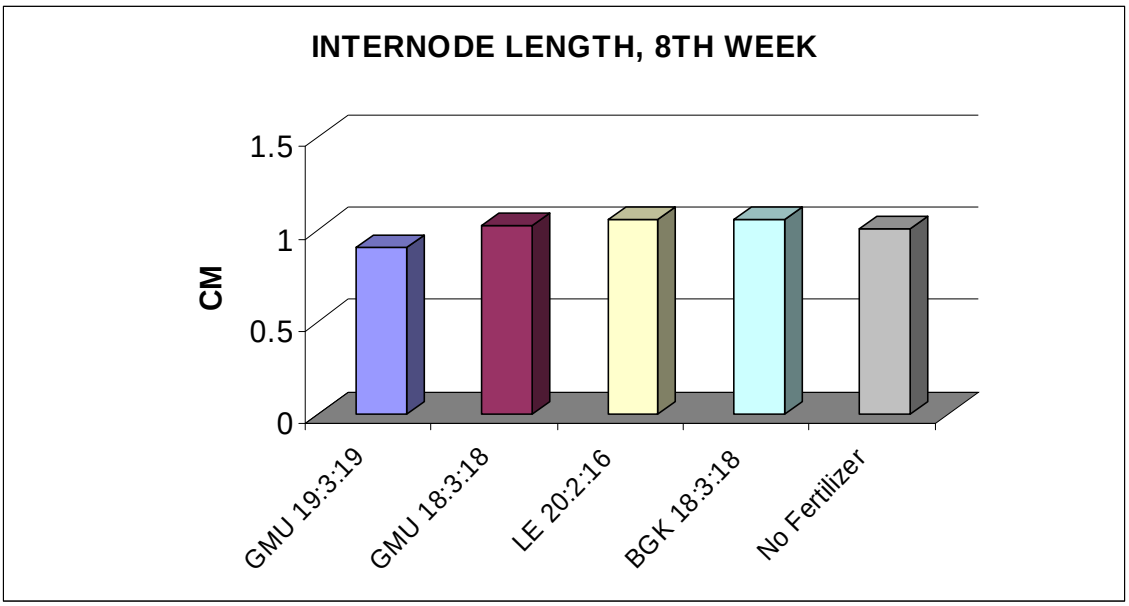


Figure 4. Means of internode length of stolon of bermuda tifdwarf mowed at 5mm and fertilized with 4 different types of fertilizers at the rate of 4.88 g N/m^2/month and applied in two split applications at every two weeks.

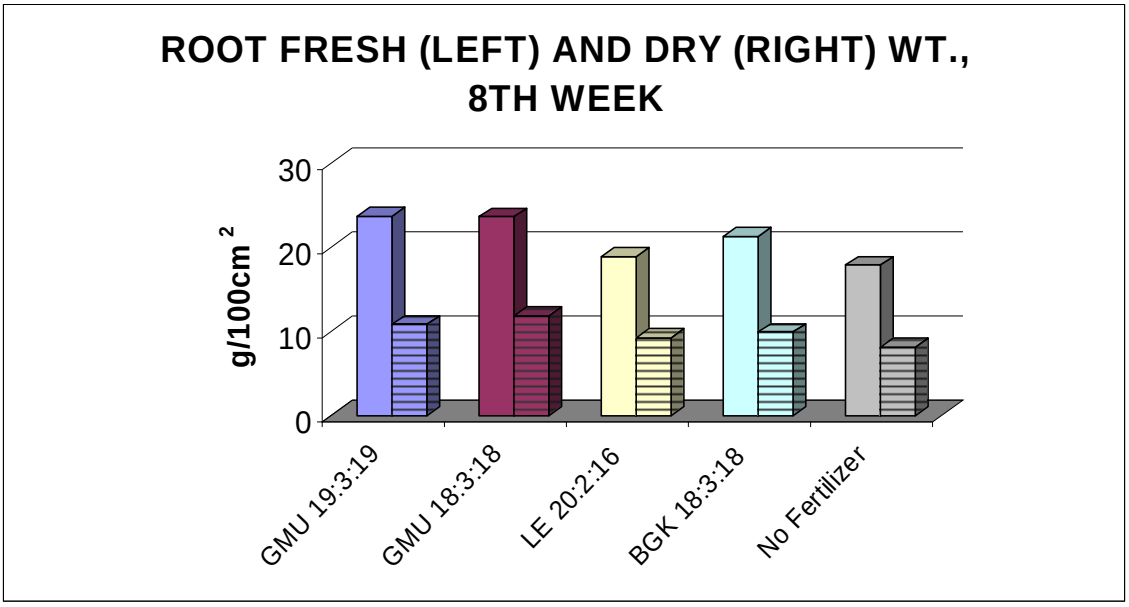


Figure 5. Means of root fresh (left) dry (right) weight (g/100 cm^2) of bermuda tifdwarf mowed at 5mm and fertilized with 4 different types of fertilizers at the rate of 4.88 g N/m^2/month and applied in two split applications at every two weeks. Data were taken on the 8^{th} week.

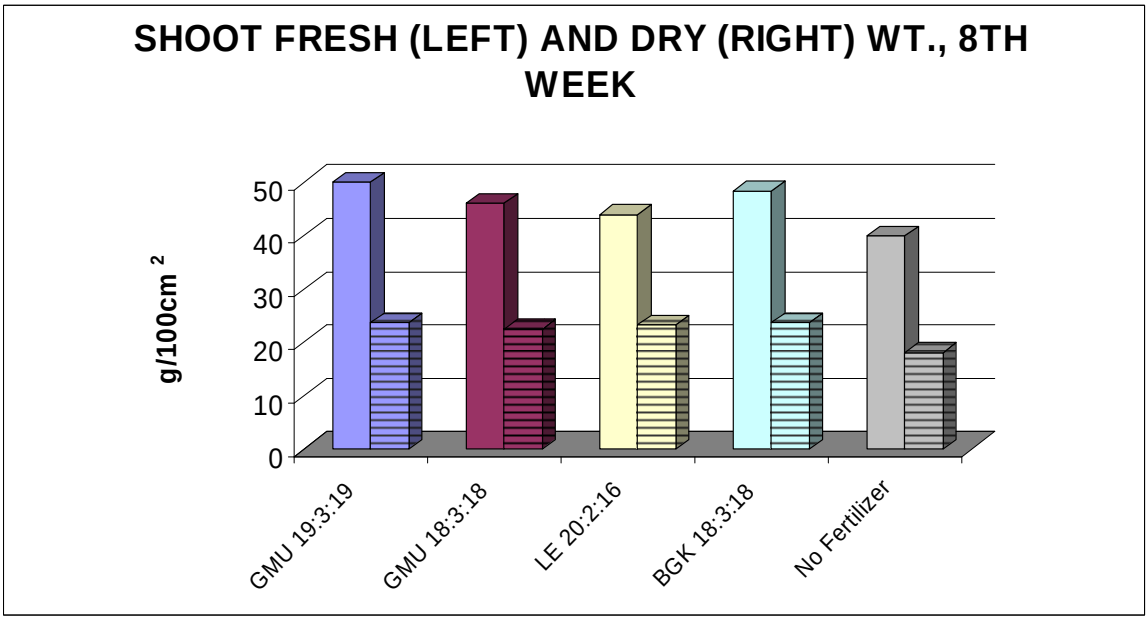
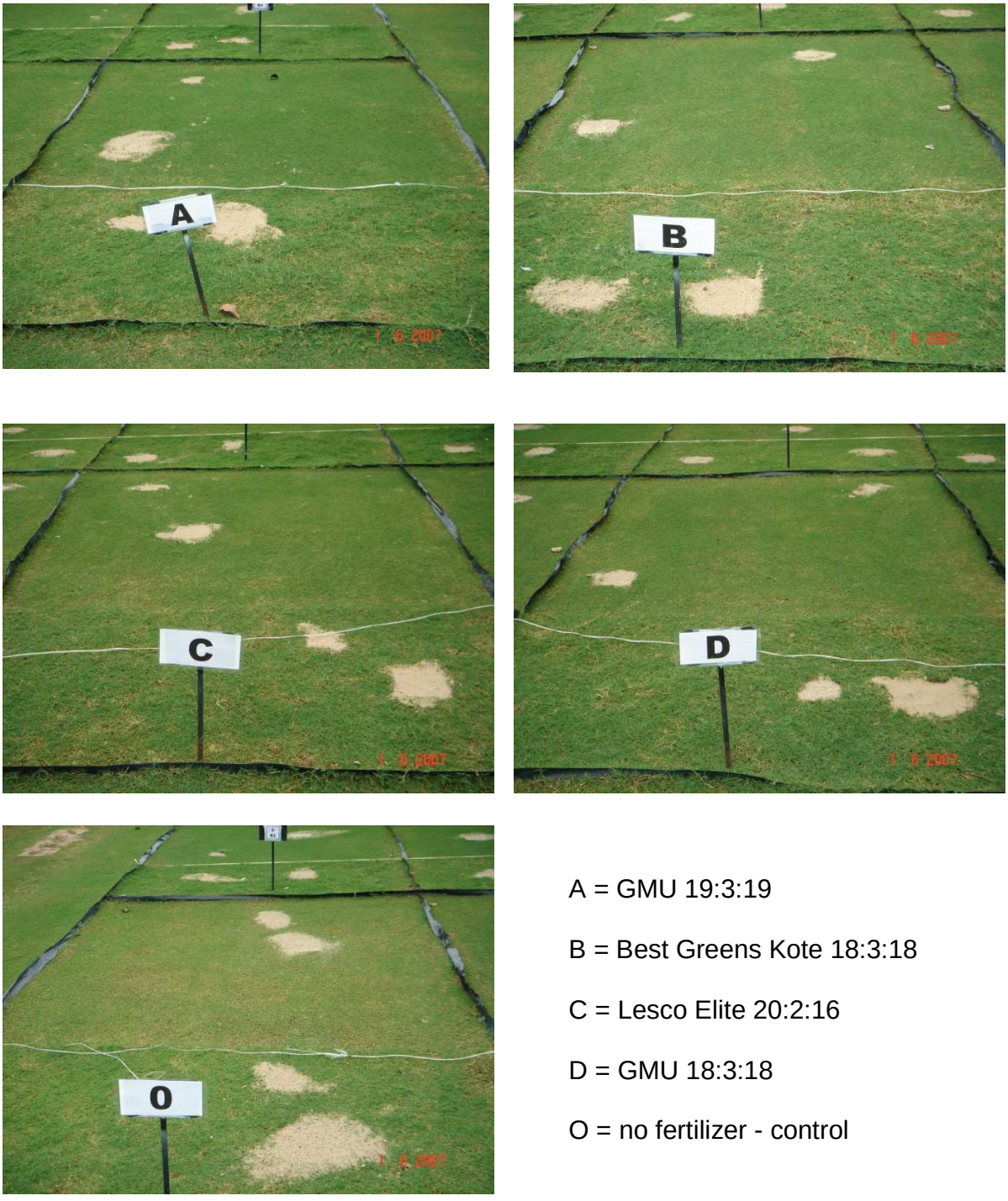


Figure 6. Means of soot fresh (left) dry (right) weight (g/100 cm^2) of bermuda tifdwarf mowed at 5mm and fertilized with 4 different types of fertilizers at the rate of 4.88 g N/m^2/month and applied in two split applications at every two weeks. Data were taken on the 8^{th} week.

Figure 7. Field photograph showing the layout of the experiment. The five fertilizer treatments (4 fertilizer types + 1 control) were arranged in RCBD with 4 replications. The plot size was 2 m x 3 m and mowing and data were taken from 2m x 2m area from each plot. The plots were separated by black plastic film planted 10 inches inside the ground to avoid fertilizer movement from plot to plot.



A = GMU 19:3:19

B = Best Greens Kote 18:3:18

C = Lesco Elite 20:2:16

D = GMU 18:3:18

O = no fertilizer - control

Figure 8. Field photograph showing the color intensity of the turf at 8th week after fertilizer application..

Figure 9. Field photograph showing the differences in color intensity of the turf at 8th week after fertilizer application. Top left = O, no fertilizer; top right = D, GMU 18:3:18; botton left = C, Lesco Elite 20:2:16: bottom right = A, GMU 19:3:19. The A (GMU 19:3:19) fertilizer resulted a much darker green color on the turf followed by C. The control plot (no fertilizer) shows brownish green in color due to malnutrition.