www.sospublication.co.in Journal of Advanced Laboratory Research in Biology

We- together to save yourself society e-ISSN 0976-7614

Volume 3, Issue 1, January 2012 Research Article

The Effect of Fertilizer Treatments at Three Compactness Levels on Qualitative Traits of Sport Lawn in Winter Season

Soheila Javahery*, Hossein Zarei, S.A.R. Movahedi Naeini, Malihe Eftekhari and Gh. Roshani[1]

**Department of Horticulture, Gorgan University of Agricultural Sciences and natural resources (GUASNR), Basij Square Golestan, Gorgan, Iran.*

[1]Academic member of Agricultural Research Center of Golestan Province, Gorgan, Iran.

Abstract: Lawn quality, which introduces by good color, density, uniformity and texture varies depending on the species, maintenance operation, and time of the year. In the current study, the effect of organic fertilizers containing Leaf Mold (LM), Rice Husk (RH), manure, Spent Mushroom Compost (SMC), a mixture of LM, RH and SMC (mixture 1), a mixture of LM, RH and manure (mixture 2), with the ratio of 1:1:1 and control (no fertilizer) at three levels of soil compactness including roller weights of 36, 56, 76 kilograms on qualitative traits of sport lawn were investigated in winter season. Treatments were applied in a strip plot design with three replications, in research farm of Gorgan University of Agricultural Sciences and Natural Resources during fall 2008-2009. According to achieved results, manure and RH treatments in first and second compaction and manure treatment in third compaction level showed the highest amount of chlorophyll content. In visual assessment, the highest and lowest of lawn quality was observed in the manure and the control treatment respectively. In first and second compaction, the maximum height was observed in manure treatment. Control and LM treatments showed the minimum height. In third compaction, maximum and minimum heights were associated with manure and control treatment respectively.

Keywords: Sport Lawn, Organic Fertilizer, Compaction, Appearance Quality.

1. Introduction

The lawn is well known to protect soil towards erosion. This covering plant decreases rain particle effects and by increasing, water penetration decreases runoff and protects soil from moving. As well, because both nutrients and deposits are moved by erosion, lawns play key role in protecting water quality (Soldat *et al*., 2001). Lawn cultured environments are crowded and compact environments in which plants compete with each other and to trees and shrubs on water and nutrients. Therefore, it is obvious that in result of this competence, fertilizer use will be needed. Soil also needs a permanent nutrient source for providing to these plants. Appropriate fertilizing will result in proper color, density and power of a lawn. Such a lawn is less sensitive to diseases, insects and weeds. A suitable fertilizing program is one of the main aspects of proper lawn protection. This means that a suitable program is one that provides required nutrients for optimum growth of the lawn. The aim of this plan should be the adequate development of lawn aerial parts, without negative effect on root growth. Application of slowly released fertilizers like organic fertilizers prevent the aerial part overgrowth and will provide nutrients for lawn permanently (Ugur and Esvet, 2007). In this field Haghighi *et al*., (2006) assessed the effect of spending mushroom compost with different decay degrees, without mixing with clay and with it and also with a different distribution thickness on Bermuda grass growth. Based on obtaining results, 6-month old compost showed its profit towards two other composts (fresh and one-year-old compost) regarding density and steadiness. In other research, the effect of three-bed cultures comprising clay, fine sand mixture and cellulosic wastes of date palm and also mixture of fine

*Corresponding author:
E-mail: s.javahery20@gmail.com.

sand and spent mushroom compost on some quality features of lawn like chlorophyll content, root density, growth rate, etc. was assayed. Results showed that in clay culture beds, growth rate and chlorophyll content is significantly more than sandy culture beds (Arghavani *et al.*, 2006). Soil compactness is also a serious problem in the pleasure places containing lawn since changing soil physical properties can conversely affect plant growth and its management. For example, in an experiment appearance quality, covering a percentage and unstructured carbohydrate content of three species of cool-season lawn decreased with increase of soil compactness (Carrow, 1980).

Hence, in the present study, the effect of seven organic fertilizers in three compactness level on growth and appearance quality of sport lawn was evaluated in Gorgan conditions.

2. Materials and Methods

The research was conducted in two stages of field and laboratory, at research farm and laboratories of agronomic sciences faculty in Gorgan University of Agricultural Sciences and Natural Resources during 2008-2009. The experimental design was a strip plot with three replications. Lawn used was sports lawn, seed mixture of *Lolium perenne* cultivar "Rival" (55%), *Poa pratensis* cultivar "Geronimo" (35%), *Festuca rubra* cultivar "Rubra" (5%) and cultivar "Apache" (5%). Organic fertilizers which were mixed to the topsoil surface included leaf mold (LM), rice husk (RH), livestock manure, spent mushroom compost (SMC), a mixture of LM, RH and SMC (mixture 1), a mixture of LM, RH and livestock manure (mixture 2) with the ratio of 1:1:1 and control (no fertilizer, In addition, three compaction treatments contained roller weighted of 36, 56 and 76 kilograms. The area of project land was 350m^2. After plowing, leveling and implementation scheme, the land was divided into 63 experimental units with dimensions of 2 × 2m^2 and the distance between the experimental units was considered one meter. Then organic fertilizers applied to the soil surface in a three cm layer and incorporated with shovel to a depth of 10-15cm by the worker. Three compaction treatments were applied with a roller, which its weight could be changed by adding or removing water to its tank. After planting seeds with the amount of 45gr/m^2, other lawn maintenance operation was conducted regularly and similarly in all plots. Samples were taken in mid-season and leaf chlorophyll content as lawn color index was determined, using 80% acetone (Arghavani *et al*., 2006). At the end, of each month visual evaluation of turf quality, based on cover rate, turf color and density (rate of tillering) were performed on a rating scale that ranged from 1-9 with 9 being most desirable. In the end, their average was considered for this season (Adavi *et al*., 2005). Height of lawn randomly was measured with a ruler in three points per every plot from the lawn crown till the end of last leaf, almost before every mowing and their average was considered (Adavi *et al*., 2005). Samples of every plot were taken using a mower that its cutter blade set at 5cm above ground. The dry matter rate of different treatments was determined after drying fresh samples at 70˚C for 48 hours (Adavi *et al*., 2005). Statistical analysis was performed with SAS software. Significant differences between means were determined by LSD test at the 5% level (Soltani, 2007).

3. Results and Discussion

3.1 Chlorophyll

ANOVA results showed that in case of chlorophyll the interaction between compactness and fertilizer treatments is significant ($p < 0.01$). In this season, manure and rice husk treatments in the first and second compactness and manure in third compactness had the highest total chlorophyll. The lowest chlorophyll content was also observed in the first compactness of leaf mold treatment, second compactness of control treatment and the third compactness of leaf mold and control treatment (Fig. 1).

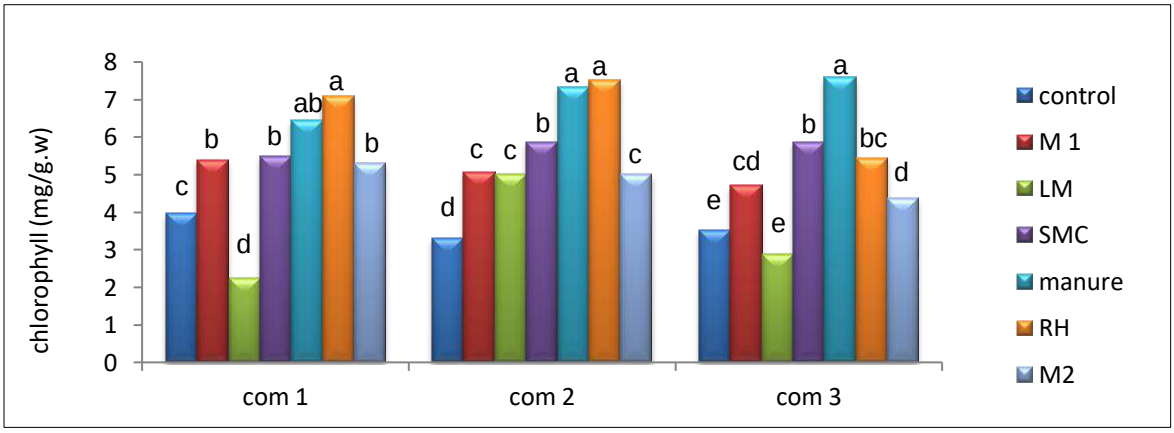

Fig. 1. Comparison of fertilizer treatments in three compactness levels on leaf total chlorophyll content in winter.

Table 1. Chemical analysis results of four organic fertilizers [Same letters in a column shows insignificant differences (p 0.05)].

Nutrient	RH	SMC	Manure	LM
Nitrogen (%)	^{d}0/87	^{b}1/53	^{a}1/96	^{c}0/94
Phosphorus (%)	^{c}0/13	^{b}0/2	^{a}0/35	^{d}0/08
Potassium (%)	^{c}0/52	^{a}1/54	^{b}1/28	^{d}0/2
Magnesium (%)	^{d}0/19	^{b}0/94	^{a}0/97	^{c}0/61

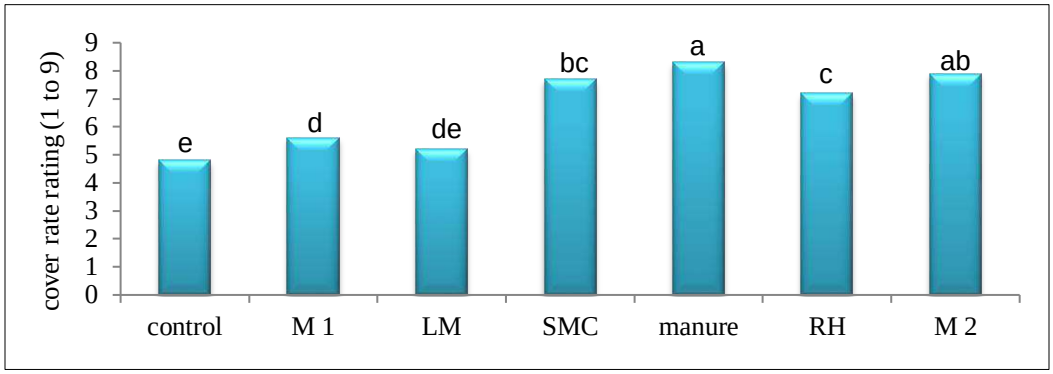

Fig. 2. Comparison of fertilizer treatments on lawn covering rate in winter.

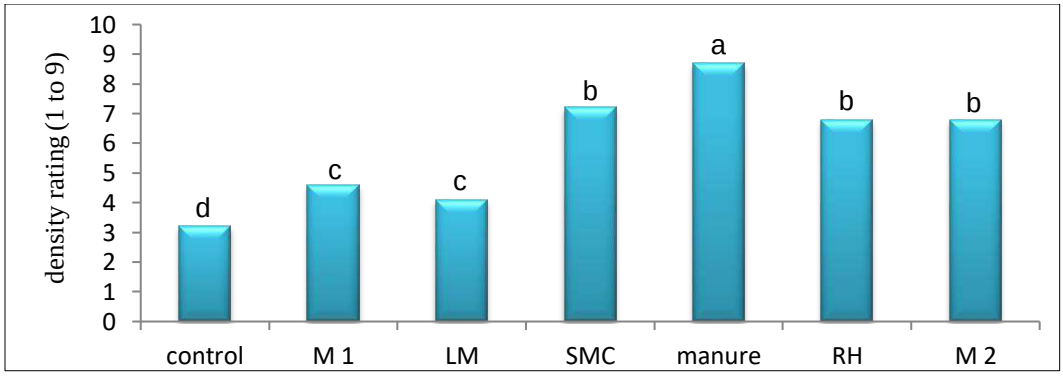

Fig. 3. Comparison of fertilizer treatments on lawn density in winter.

Nitrogen and Magnesium are needed better than every factor in the chlorophyll synthesis so that other elements do not compensate their deficiency. In this case, other researchers also found similar results in wheat, perennial ryegrass (*Lolium perenne*) and Bermuda grass (*Cynodon dactylon*) (Geisel *et al*., 2001; Lingzhi *et al*., 2004; Cheng *et al*., 2007; Tranaviciene *et al*., 2007). By measuring Nitrogen and Magnesium of four organic materials of leaf mold, spent mushroom compost, manure and rice husk, the highest Nitrogen and Magnesium was attributed to organic fertilizers of spent mushroom compost and manure (Table 1). Furthermore, according to the obtained results of this experiment, plots containing manure and spent mushroom compost had the highest content of chlorophyll.

3.2 Covering rates

In the measuring of this feature, the interaction between fertilizer and compactness treatments was insignificant. Based on Fig. 2, the highest covering rate was detected in manure and mixture 2 respectively which have not any significant difference between them. Moreover, in this season, control and leaf mold treatments had the low and medium covering rate respectively.

3.3 Density

According to the ANOVA table, the interaction between fertilizer and compactness treatments on herbs density was not significant while the effect of fertilizer treatments was significant. So, that manure treatment had the highest density and control treatment had an unfavorable density (Fig. 3).

3.4 Lawn greenness

The interaction effect of fertilizer and compactness treatments on this feature was insignificant. By comparison, of color degree of different treatments (Fig. 4), the best color was observed in manure and mixture 2 treatments respectively which have not significant difference. The lowest color degree was attributed to control and leaf mold treatments.

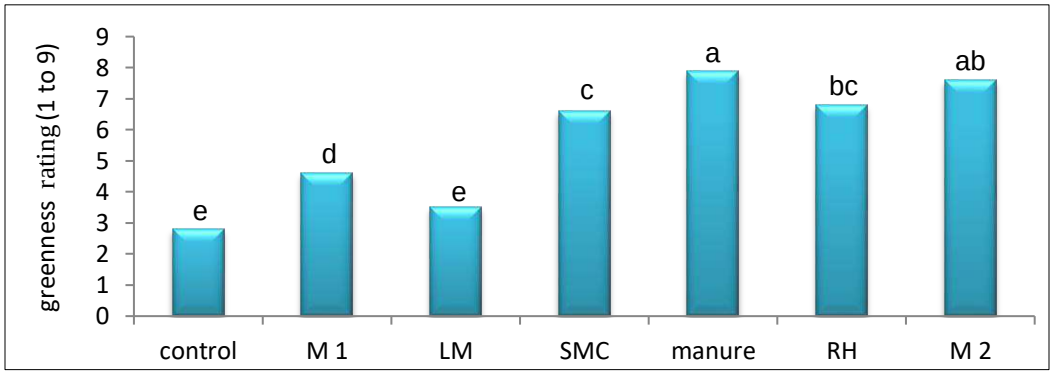

Fig. 4. Comparison of fertilizer treatments effect on lawn greenness in winter.

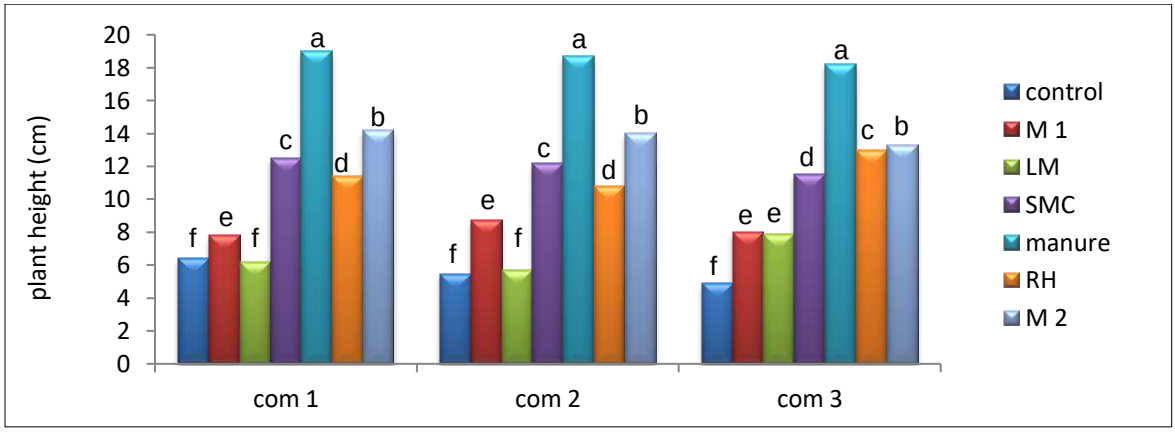

Fig. 5. Comparison of fertilizer treatments in three compactness levels on plant height in winter.

Several studies have detected that appearance quality is variable due to organic fertilizer use. For example, the result of using organic fertilizers, acceptable appearance quality of lawn is in comparison with appearance quality of urea and chemical fertilizer use (Agnew, 1992; Carrow, 1997; Davis & Dernoden, 2002; Garling & Boehm, 2001). While other studies have shown, lower appearance quality and paler green color due to the application of organic fertilizers (Carey, 1997; Carrow, 1997). These results are also in accordance with other researches (Agnew, 1992; Carrow, 1997; Davis & Dernoden, 2002; Garling & Boehm, 2001). So that, appearance quality of organic fertilized plots was better than the grown lawn in control plots. Manure treatment was known as the best treatment considering color degree, density and covering rate, which is attributed to the higher Nitrogen and Magnesium in this organic matter (manure). Since the existence of these elements causes chlorophyll synthesis, more growth and tillering (Angle *et al*., 1981).

3.5 Height growth of plant

In this measurement, the interaction effect of culture beds and compactness types was significant. In the first and second compactness levels, the highest height was detected in manure treatment and the lowest was observed in control and leaf mold treatments. Moreover, in these two compactness levels, the height decreased in mixture 2, spent mushroom compost, rice husk and mixture 1 respectively. In the third compactness also manure and control treatments demonstrated the highest and the lowest height respectively in the winter (Fig. 5).

Higher height in different treatments (compared to control treatment) may be attributed to the saving water by these culture beds and improving the soil structure (Angle, 1994; Brady & Weil, 1999) because water deficiency is the main restrictor factor in lawn growth. On the other word, organic materials act as a balancing factor. So, that in heavy soils decrease water standing and increase surface drainage while increase water saving capacity in sandy and light soils. In this research, the positive effect of organic improvers on height is similar to the effect of cellulosic wastes of date palm in the experiment of Arghavani *et al*., (2006). Also, these results are in accordance with the Nasrollahzade Masole *et al*., (2009) founding in the case of height enhances due to organic fertilizer application. We can express the more content of Nitrogen, Phosphorus, potassium and Magnesium in two organic materials of manure and spent mushroom compost as another reason for height increase in these culture beds.

4. Conclusion

As both improvers containing manure or spent mushroom compost have better quality than other treatments in this research, these fertilizer mixtures can be suggested in order to improve quality features of sport lawn in all three compactness levels by related experts.

References

[1]. Adavi, Z., Razmjo, K.H. & Mobli, M. (2005). The study of compatibility ten cultivars of *Cynodon* sp. in Isfahan climate condition. *Journal of Sciences and Horticultural technology*, 6(1): 1-14 (In Farsi).

[2]. Agnew, M.L. (1992). *Slow-Realize fertilizers: Natural Organic Nitrogen Source*. Golf course management, 70- 75.

[3]. Angle, J.S. (1994). Sewage sludge compost for establishment and maintenance of turfgrass. In: Leslie, A.R. (Ed), *Handbook of residue integrated pest management for turf and ornamentals*. (pp. 45-52.) Lewis publisher, Boca Raton.

[4]. Angle, J.S., Wolf, D.C. & Hall, J.R. (1981). Turfgrass growth aided by sludge compost. *Biocycle*, 2, 40-43.

[5]. Arghavani, M., Kafi, M., Khalighi, A. & Naderi, R. (2006). The effect of various culture media and netting on some sod quality traits. *Iranian Journal of Agricultural Sciences*, 37(6): 1023-1029 (In Farsi).

[6]. Carey, K. (1997). Performance of Ecoval product on "Penncross" creeping bentgrass USGA putting greens (Annual Research Report 1997: 48-56). Guelph Turfgrass Institute.

[7]. Carrow, R.N. (1997). Turfgrass response to slow-release nitrogen fertilizers. *Agronomy*, 89: 491-496.

[8]. Carrow, R.N. (1980). Influence of soil compaction on three turfgrass species. *Agronomy Journal*, 72: 1038-1042.

[9]. Cheng, H., Xu, W., Liu, J., Zhao, Q., He, Y. & Chen, G. (2007). Application of Composted Sewage Sludge (CSS) as a soil amendment for turfgrass growth. *Ecological Engineering*, 29: 96-104.

[10]. Davis, J.G. & Dernoeden, H. (2002). Dollar spot severity, tissue nitrogen, and soil microbial activity in bentgrass as influenced by nitrogen source. *Crop Science*, 42: 480-488.

[11]. Garling, D.C. & Boehm, M. (2001). Temporal Effects of Compost and Fertilizer Applications on Nitrogen Fertility of Golf Course Turfgrass. *Agronomy Journal*, 93: 548-555.

[12]. Geisel, P., Le Strange, M. & Silva, D. (2001). Topdressing compost on Bermuda grass: Its effect on turf quality and weeds. *California Turfgrass Culture*, 51(1): 1-4.

[13]. Haghighi, M., Kafi, M. and Tehranifar, A. (2006). Effect of decay level of SMC (Spent Mushroom Compost) and media Diameter and compound on turfculture in Hydromulching Method. International Journal of Agriculture and Biology 8(5): 691-693.

[14]. Ling-zhi, T., Zhao-rong, D., Jie, S., Bo, Z., Chang-an, L. & Yan-yan, L. (2004). Effect of mowing and topdressing of nitrogen on photosynthetic characteristics in triticale. *Journal of Anhui Agricultural University*, 31(1): 72-75.

[15]. Nasrollahzade Masoleh, A., Amiri, A. & Razavipour Komle, T. (2009). Effect of Azula compost, Manure and chemical fertilizer on *Oryza sativa*. In 11th Iranian soil sciences congress, 12-15 Jul., Gorgan University of Agricultural Sciences and Natural Resources, Iran, Gorgan, P 321 (In Farsi).

[16]. Soldat, D., Petrovic, A.M., Rao, R. & Bruulsema, T.W. (2007). Testing turfgrass soil. *Better Crops with Plant Food*, 91(1): 26-27.

[17]. Soltani, A. (2007). *Application of SAS software in the statistical analysis (for agricultural fields)*. Jahad- Daneshgahi Mashhad press (In Farsi).

[18]. Tranavičienė, T., Šikšnianienė, J.B., Urbonavičiūtė, A., Vagusevičienė, I., Samuolienė, G., Duchovskis, P., & Sliesaravičius, A. (2007). Effect of nitrogen fertilizers on wheat photosynthetic pigment and carbohydrate contents. *Biologija*, 53(4): 80-84.

[19]. Bilgili, U., & Acikgoz, E. (2007). Effect of nitrogen fertilization on quality characteristics of four turf mixtures under different wear treatment. *Journal of Plant Nutrition*, 30: 1139-1152.