THE INFLUENCE OF AERATION WORKS ON THE TURFGRASS QUALITY

C.I. POPOVICI[1], V. VÎNTU[1], C. SAMUIL[1]

[1] The University of Agricultural Sciences and Veterinary Medicine „Ion Ionescu de la Brad" Iaşi
e-mail: ipopovici@uaiasi.ro

Thatch accumulation in lawns especially under a defective fertilization and irrigation program may become a real problem for landscapers, golf course superintendents and homeowners. A thatch layer thicker than 2 cm can cause more than one problem from water and nutrients deficiencies to serious disease infestation.

***Key words**: thatch, turfgrass, dethatching*

At soil surface, a thatch layer is formed, due to dry shoots, aerial stolons and cut leaves. The causes of this phenomenon are varied and belong both to the biology of perennial grasses from lawns and to some favouring factors for excessive thatch accumulation **[**1,2,3,4**]**. Identifying these factors helps in adopting some preventive measures for diminuting thatch accumulation. Most of these factors are determined by bad approaches in turfgrass management. The irrational use of nitrogen fertilizers is one of the major causes of the excessive development of thatch layer. Using high nitrogen rates may result in a luxuriant biomass increase that breaks the capacity of microorganisms to help crop residue decay.

The species of perennial grasses used in lawns have an important effect on thatch formation. Generally, the most liable species to the excessive thatch accumulation are those with a great density of shoots from chilly and wet areas, like *Festuca rubra* var. *commutata.*

MATERIAL AND METHOD

Trials were set up in 2005 on a meso-calcaric cambic chernozem, under soil and climatic conditions of the Moldova forest steppe. The used management works were those known for turfgrass management under non-irrigated. The sum of rainfall amount during the vegetation period was of 372 mm and the mean temperature in the same period was of 20.2^0C.

Aeration works were done with the multi-functional Stihl MM-55, which has two aeration organs, respectively dethatching and a device for removing moss from upper soil layer and another aeration and unsettling device of turfgrass.

The followed experimental factors were:

Factor A – Type of aeration work:

- a_1 – control variant (C);
- a_2 – deep aeration (AA);
- a_3 – superficial aeration (AS);
- a_4 – deep aeration + superficial aeration (AA + AS).

Factor B – Type of mixture:

- b_1 – *Lolium perenne* 100% - Mara Romanian variety;
- b_2 – *Lolium perenne* 60% + *Poa pratensis* 40%;
- b_3 – *Lolium perenne* 50% + *Festuca pratensis* 50%;
- b_4 – *Lolium perenne* 60% + *Festuca arundinacea* 40%;
- b_5 – *Festuca pratensis* 60% + *Poa pratensis* 40%;
- b_6 – *Festuca arundinacea* 60% + *Poa pratensis* 40%;
- b_7 – *Lolium perenne 50%* + *Festuca pratensis* 30% + *Festuca arundinacea* 20%;
- b_8 – *Lolium perenne* 40% + *Festuca pratensis* 20% + *Festuca arundinacea* 20% + *Poa pratensis* 20%;
- b_9 – *Festuca rubra* 70% + *Poa pratensis* 30%.

For assessing the general quality of turfgrass, we have used the visual evaluation scale, elaborated by the National Turfgrass Evaluation Program (NTEP) from USA.

This programme provides a scale of notation from 1 to 9, where 1 is the lowest value of the studied indicator and 9 is the highest value.

RESULTS AND DISCUSSIONS

The general quality of turfgrass obtained by sowing mixed perennial grasses has increased, as influenced by aeration treatments, especially in case of variants AS and AA+AS (*tab. 1*, *fig. 1*).

The first month after beginning the aeration works, no significant differences were noticed as concerns turfgrass quality, but the next month, the differences became evident, very significant statistically assured yield increases being recorded in AS and AA+AS variants, which were noted with 5.3, respectively, 5.9. The AA variant has known a less significant increase, being noted with 5.4, while the control variant was noted with 4.1 In a trial carried out in 2004 on a football field, where turfgrass aeration works were done.

Table 1

Turfgrass general quality according to applied aeration work (NTEP, 1-9)

Testing variant	June				July				August				September			
	C	AA	AS	AA + AS	C	AA	AS	AA + AS	C	AA	AS	AA + AS	C	AA	AS	AA + AS
Mixture variants	4.6^{Ct}	5.1*	5.3***	5.9***	4.8^{Ct}	5.3***	5.7***	5.8***	2.8^{Ct}	3.0	3.8***	3.7***	3.5^{Ct}	3.5	4.6***	4.7***
	LSD 5% = 0.2 LSD 1% = 0.3 LSD 0.1% =0.5				LSD 5% = 0.1 LSD 1% = 0.2 LSD 0.1% =0.3				LSD 5% = 0.2 LSD 1% = 0.3 LSD 0.1% =0.5				LSD 5% = 0.2 LSD 1% = 0.3 LSD 0.1% =0.5			

J. M. Morhard and **S. Klisinger** noticed that on short time, the turfgrass quality does not change significantly, as influenced by aeration works; however, some soil physical characteristics improve, like the increase in soil total porosity and the diminution in resistance to penetration. In July, very significant differences were recorded in all the three aeration works, the greatest note, 5.3, being given to the AA variant, followed by the AS variant with 5.7 and AA+AS with 5.8.

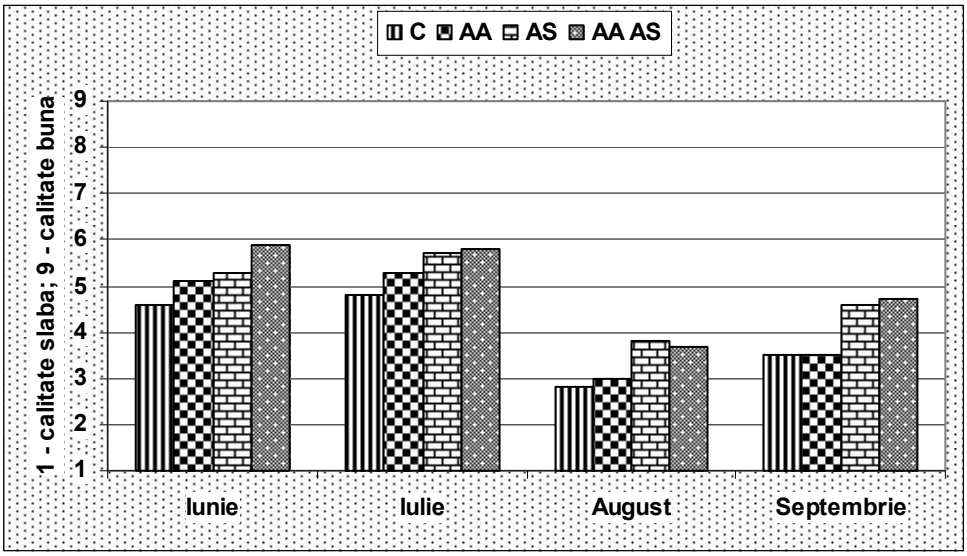

Figure 1 **Influence of aeration works on turfgrass quality**
(1 – low quality; 9 – good quality; June, July, August, September)

In August and September, the lowest turfgrass quality was recorded from all the year and, however, AS and AA+AS variants had very significant statistically assured differences, compared to the control.

Table 2

Influence of mixture type and aeration work on mean annual values of quality (NTEP, 1-9)

Testing variants	Annual mean			
	C	AA	AS	AA + AS
L. p.100% (control)	2.5 Ctr.	2.6	3.5	3.5
L.p.60% + P.p. 40%	3.6	3.9	4.6	4.7
L.p. 50% + F.p. 50%	2.9	3.0	3.5	3.6
L.p. 60% + F.a. 40%	4.1	4.6	5.1	5.3
F.p. 60% + P.p. 40%	4.0	4.3	4.7	4.8
F.a. 60% + P.p. 40%	6.2	6.6	7.3	7.4
L.p. 50% + F.p. 30% + F.a. 20%	4.2	4.3	5.0	5.1
L.p. 40% + F.p. 20% +F.a. 20% + P.p. 20%	4.5	4.7	5.0	5.3
F.r. 70% + P.p. 30%	6.1	6.5	7.1	7.3
	LSD 5% = 0.7 LSD 1% = 0.9 LSD 0.1% = 1.1			

Analysing the behaviour of each mixture, we noticed a more evident response to aeration at the mixtures made of *Festuca arundinacea* 60% + *Poa pratensis* 40%, *Festuca rubra* 70% + *Poa pratensis* 30%, *Lolium perenne* 60% + *Festuca arundinacea* 40%, where the difference between AA+AS and C variants was of 1.2 points (tab. 2). A good response was also found at the mixture made of *Lolium perenne* 60% + *Poa pratensis* 40% and at the control variant (*Lolium perenne* 100%), where the difference between AA+AS and C was of 1.1, respectively, 1 (*tab. 2*). A weaker response was found in the mixtures containing a higher percent of *Festuca pratensis,* that is the mixture made of *Lolium perenne* 50% + *Festuca pratensis* 50% and the mixture made of *Festuca pratensis* 60% + *Poa pratensis* 40% , where the differences between AA+AS and C were of 0.7 respectively, 0.8 points.

CONCLUSIONS

Turfgrass aeration works are important for maintaining turfgrass quality, especially at the mixtures containing species that form with time a strong thatch layer.

The best period for these works is during the vegetation period, at the beginning of summer, when plants are at full development stage; therefore, grass recovery should be easy.

Turfgrass quality is also influenced by the period following the aeration treatments, because unfavourable climatic conditions, like drought and high temperatures, can damage the recovery process.

Among the three types of aeration works, the most powerful (AS and AA + AS) proved to be the best on long-term.

The effect of aeration is not an immediate one, but it is noticed after a longer period, according to the climatic conditions and the other management works.

BIBLIOGRAPHY

1. Couillard, A.; Turgeon, A.J., 1997 - *Composition of turfgrass thatch.* Communications in soil science and plant analysis ISSN: 0010-3624; p. 1199-1207.
2. Cuddeback, S. and Petrovic, A.M., 1985 - *Traffic effects on the growth and quality of Agrostis palustris Huds. (creeping bentgrass).* International turfgrass research conference, ISBN 2-85340-686-5. p. 411-416.
3. Madison, J.H., 1981 - *Frequent sand topdressing vital tonic for greens.* Golf Course Management 49 (8): 17-20.
4. Martin, D.P., 1970 - *The composition of turfgrass thatch and the influence of several materials to increase thatch decomposition.* MS Thesis, Michigan State University, East Lansing, MI.
5. Morhard, J.M., Kleisinger, S., 2004 - *Short-term effects of deep tine cultivation on soil oxygen, penetration resistance and turf quality of two soccer fields.* ISHS Acta Horticulturae 661 - International Conference on Turfgrass Management and Science for Sports Fields, ISSN - 0567-7572.