SUMMARY

Lawns always influenced and especially today, the quality of life, by playing an important role in the architecture of leisure and recreational areas. Green areas are the places where we go to walk, to do sports or watch sports. European or american football, rugby, tennis on grass, golfing are practiced activities of people from all social classes, awarded with great popularity, turning the turfgrass industry into a major industriy. For the sports, the game surface quality is of a great importance and the investments are the same.

The growing demand of perennial grass seed for lawn has pushed farmers to focus on producing new plant varieties who best meet the most demanding requirements.

In developed countries like USA, France, England, Australia, we encounter a very developed turfgrass industry, from companies dealing with seed or sod production, big marketers or landscape contractors and industry of machinery and equipment needed to produce and maintain turf.

In the United States alone there are over 70,000 turf companies operating, with a turnover of 61 billion dollars, an average of 8.7 full time and 2.7 part time employees and an average profit for 1997 of $ 77,490.

The seeds for turf sold in our country are mainly imported from other countries and do not always meet the requirements of the climatic conditions of our country. Varieties from countries such as Holland, Denmark, France are bred and improved for the climate in these countries, and when they are used in our country can have poor performance, if not properly maintained. It requires closer cooperation between Romanian turf companies and importers to improve results and performance of the products it sells, by conducting trials in which varieties and mixtures are to be tested before they are sold.

Thus one can determine the varieties that can adapt best in the climate of Romania, contributing for obtaining of a quality lawn.

Knowing the highs and lows of perennial grass varieties, like establishment, percent

ground cover, density, and especially resistance to diseases and drought, can help to use them in a judicious manner (F. Veronesi et al., 1997). In this direction an approach is made by the organization National Association Turfgrass Program (NTEP) from Maryland, USA, through the voice of director Kevin N. Morris, an international authority in this field, who promotes the organization of trials in as many countries as possible. Producers are encouraged to submit their varieties in as many trials as possible acquiring free advertising in the same time.

This doctoral thesis aims to contribute to a better understanding of the performance of commercial turfgrass varieties produced in countries with different climate from that of Romania, to bring new information regarding the performance of perennial grasses used in mixtures leading to the best solutions for the composition of mixtures of perennial grasses for turf in climatic conditions in the NE area of Romania.

The thesis has 7 chapters, the first two presenting the most common grass species used for turfgrass as well as the research level up to date in the field of study. In the third chapter is described the natural environment of experimentation area. Field trials were started in 2005 at the local farm Ezareni located at a distance of 2.5 km south-est from the city of Iasi.

In terms of geographic positioning, the Ezăreni farm coordinates fall between $47^0$5'-$47^0$10' North and $27^0$28' -$27^0$33' East. The Moldova Plain landscape looks wide wavy, with interfluves and hills and low plateaus. The landscape has gentle contours, with oblonged inclination to the S and SE, with only one steeper coast to the N and NW, and broad valleys.

Annual average temperature is 9.4 °C, the minimum temperature is -8.1 °C registering in January, and multi-annual maximum temperature is 28.4 °C registered in July. Absolute maximum temperature was 40.2 °C (July 1909), and the absolute minimum was ~ 30.6 °C (January 1997). Amplitude temperature reaches high values of 70 °C, determined by the absolute maximum values (40 ° C) in July and the absolute minimum (-30 ° C) in January.

The fourth chapter presents the goal, the objectives, the biological material and the research methods used. Biological material used in this experiment consists of 32 perennial grass varieties, 4 of which are Romanian, 18 from Danish company DLF Trifolium, and 10 from various companies from USA Foreign varieties were used in pure stand, mostly as a requirement for companies that have donated them and who wanted individual assessment of each variety in the climatic conditions in our country. To achieve the objectives proposed in this study we started three experiments in 2005. The first two were sown on April 13 and the third on May 25 due to the delay with which the seeds were sent from USA The first experiment is monofactorial, with 9 experimental plots disposed in randomized blocks, sown with simple and complex mixtures and the control plot sown with the variety Mara (*Lolium perenne*). The second experiment is monofactorial, with 18 experimental plots disposed in randomized blocks where

the grass varieties from the company DLF Trifolium were sown in pure culture.

The third experiment, is organized by randomized blocks method and it is composed of 10 experimental plots sown with American varieties.

To determine the influence of management on turf quality, all three experiments were reorganized in 2008 as bifactoriale experiments with plots arranged in subdivided randomized blocks.

The Fifth Chapter presents data on the quality of simple and complex mixtures under the influence of climatic conditions. Research has sought the performance of perennial grass varieties and mixtures in the climate conditions of N-E Moldavian sylvosteppe. In a first phase attention turned on the establishment, a process that is closely related to the speed of germination, followed by growth and development. Establishment is a process that not only depends on the speed and extent of emergence of plants, but also on the time span in which the lawn reaches maturity. Some species are known for the speed with which seeds germinate, one of which *Lolium perenne*, other species have a slow germination, like *Poa pratensis*.

At the same time there are differences between varieties of the same specie, eg some cultivars of *Festuca rubra* succeeds to germinate in a shorter time like the performance achieved by *Lolium perenne*, while other varieties of fine fescues have a poor germination often encountered in *Poa pratensis* **(Maitre JP, 2004).**

Measurement of the establishment was performed immediately after the germination, 20, 25, 30 days from sowing, making visual assessments on the degree of emergence expressed as a percentage. Observations were made 20 days from sowing to show a degree of emergence of 36.7% in control plot (*Lolium perenne* 100%), and at 25 days a level of emergence of 76.7%. Also, mixtures based on *Lolium perenne*, *Festuca pratensis* and *Festuca arundinacea* (V3 and V4) have made a good degree of emergence, of 43.3%. Species *Festuca pratensis* and *Lolium perenne* are used for overseeding soccer field filled with *Cynodon dactylon*, precisely because the pace of rapid installation. A weak emergence could be observed in mixtures where the specie *Poa pratensis* has a considerable share, particularly to variants V5, V6 and V9, where the degree of emergence ranged from 15,0-26,7%. At 1 month from the date of sowing the mixture *Lolium perenne* 60% + *Festuca arundinacea* 40% achieved a coverage of 83.3%, unlike the mixture consisting of 70% Festuca rubra + Poa pratensis 30%, with only 66 , 3%.

Another important indicator is drought tolerance. The mixture with the best resistance to drought was composed of *Festuca arundinacea* 60% + *Poa pratensis* 40%, rated 8. The same performance had the mixture consisting of *Lolium perenne* 50% + *Festuca pratensis* 30% + *Festuca arundinacea* 20%. The mixture consisting of *Festuca rubra* 70% + *Poa pratensis* 30% (varieties from Denmark) had the worst result, rated 4. Also, the mixture consisting of *Lolium*

perenne 60% + *Poa pratensis* 40% had a lower tolerance to drought by 29% compared to control.

The most important indicator is the overall quality of turf. The values recorded in July of 2005, grouped the 8 mixtures in a relatively short period at the top of the rating scale, with values ranging from 6.7 to 8.3. Significant differences, but negative, have been registered in the mixtures based on *Festuca pratensis* and *Festuca rubra*, past due to low ground cover.

Festuca arundinacea-based mixture has a best summer performance while the mixture based on *Festuca rubra* has a best quality in late summer and autumn due to shoot density and very fine texture.

Use of perennial grasses in simple or complex mixtures results in a better capacity to withstand the stress induced by adverse climatic factors, versus their individual usage as the results obtained in the dry year 2007 shows. Complex mixtures consisting of three or four species show greater adaptability to climate variations obtaining superior results compared to control and simple mixtures except the simple mixture composed of *Festuca arundinacea* 60% + 40% *Poa pratensis*.

Mixture of *Festuca rubra* 70% + *Poa pratensis* 30% is more sensitive to water shortages but is well adapted to local climatic conditions, managing to overcome the early dry period in 2007 and produce a lawn with a good quality in August and September when it was rated with 6.7 and 6.

In Chapter VI are presented data on the quality of turfgrass varieties that come from USA and Denmark. The rating started in april 2006, observing a high quality in the *Poa pratensis* varieties and Penn G6 and Celianna due to a very rapid spring greenup. The five varieties of english ryegrass registered a slight difference of 0.6 points over Mara. A better quality was observed at varieties Legende, Capriccio and Dumas 1, rated 6.

A poor quality at the beginning of vegetation is observed at the species *Festuca arundinacea*, both varieties were rated 4 and also *trichophylla*, two varieties were rated 5.3.

In the late spring and early summer, in May and June, all varieties from Denmark have made significant positive and very significant differences, the best varieties were Dumas 1, rated with 8.3 in May, and the variety Conni rated 9 in June, given that the romanian variety Mara (Lp) was rated with 3.3 and 4 in May and June. A good quality was observed at Legend rated 8 in May and Starlett variety who received the same rating but in June.

During the summer, under good weather, the quality produced by Denmark turf varieties has been quite good. During this period, the Rosita variety has maintained a good quality in the two months (7), while the Smirna variety increased from 6 July to 7 August. Also variety Celianna has increased from 4.3 to 7. The best quality in summer had Conni and Dumas 1 rated

9. Varieties Montserrat, Starlett and Panduro have scored 8.

In autumn, Rosita, Smirna and Dumas 1 were rated 7 in September and 6 in October, thus confirming the good autumn performance of fine fescues also stipulated by Golinski. P in 2000.

In Chapter VII are presented data on the influence of management practices on turf quality. We studied only major indicators, namely: overall quality, percent ground cover and density.

The three treatments of dethatching produced noticeable changes in ground cover compared with control. The changes occurred both in the case of mixtures and varieties from Denmark and the USA, although the dynamics of these changes were slightly different. Soil compacting along with thatch accumulation result in decrease of the ground cover, density and overall quality of turf (a Neil KJ and RN Carrow, 1982).

In the case o turf mixtures, the highest mean value of ground cover (GC) has been achieved ob behalf of surface aeration of turf (AS) 78.8%. Making deep aeration treatments (DA) and deep aeration + surface aeration (DA + SA) has led to a GC whose values were ranged from 77.1 to 77.7%, while control (C) had a GC of 74.3% (Table 4).

GC dynamics during the three seasons studied shows that immediately after starting aeration treatment of turf, the effects they produce are not very visible, and the differences between treatments were insignificant. Among the three aeration treatments, the worst result was recorded in the most radical intervention, namely DA + SA, when GC in the spring ranged on a percentage value of 69.1%, very close to control, 68.7%. In the first 2 seasons the highest ground cover occurred in the treatment of SA, which obtained the following values: 70.6% in spring, 80.4% in summer.

PhD thesis ends with the presentation of conclusions and recommendations and references consulted during the completion of this thesis.