THE IMPACT OF PERENNIAL LOLIUM ON THE BIODIVERSITY AND THE STRUCTURE OF THE GRASSLANDS

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Abstract: *The aim of the paper is to highlight the role of natural germoplasm resource of the species Lolium perenne by adapting it to a wide variety of abiotic conditions. The impact of the presence of the species together with other legume species such as Trifolium repens in the construction of multifunctional temperate climate associations is also studied. The concept of meadow multifunctionality has developed with the reconsideration of their sustainability character in terms of an emphasis on the negative impact on the environment. Land use change in recent decades, the abandonment of grazing and the decline of traditional agricultural practices or afforestation are a major threat to biodiversity. Often the bispecific dominance between Lolium perenne and Trifolium repens is improve both feed quality and soil quality due to the added value of fixing atmospheric nitrogen. The species of Lolium perenne due to its high ecological plasticity is thus considered to be particularly important especially due to the fact that it covers a wide range of environmental conditions thus developing models of great genetic diversity which leads to a development of genomic resources. Lolium perenne is thus adapted to defoliation, fertilization and growth cycles, which is particularly important because defoliation through animal grazing can have major effects on the structure and functioning of grassland ecosystems affecting the production of shoots and root rotation of communities. of plants, but also photosynthetic rates and carbon allocation in plants: energy flow in the plant-soil system. Thus, the highlighting of the qualities of Lolium perenne species are important premises for the genetic progress of this species but especially for understanding the natural functioning of plant associations dominated by it, which leads to environmentally friendly management practices.*

Keywords: *Lolium perenne, grazing, ecological plasticity, natural germoplasm*

INTRODUCTION

Meadows are ecosystems comprising the most diverse and rich species in Western and Central Europe, those traditionally managed have been widely used in the past, have been an important element of for providing multiple habitats (F.VAN DOBBEN, 2019) and essential ecological services in maintaining biodiversity, carbon sequestration and soil biogeochemistry (BLANCO-PASTOR, J.L., 2018), (LYONS, G.A., 2013). Perennial ryegrass is one of the most important spontaneous or cultivated forage species worldwide, being used for sowing and regenerating temperate agricultural meadows, also considered an important species especially in temperate climates, prefers clay soils, ensures the production of large crops, provides fodder with high nutritional value (BECKER, T., 2020), (ROSCHER, C., 2007).

The species *Lolium perenne* actively intervenes in land use changes in recent decades, prevents due to the stability of abandonment of grazing and the decline of traditional agricultural practices (CHABUZ, W., 2019). Ecosystems where *Lolium perenne* is predominant in participation are more resistant to climate change due to increased greenhouse gas emissions, considering in the future that lower rainfall and higher temperatures will lead to more frequent and intense droughts (VOLAIRE, F., 2020). Practical structures with high diversity where *Lolium perenne* species is also present respond directly to the volume, frequency and duration of precipitation, these changes will affect the composition of the species, nutrient and carbon cycle rates, and long periods of drying and watering the soil wich can eventually lead to the loss of diversity in grassland communities (FRY, E.L., 2013).

Numerous studies are published on physiological, morphological and phenological differences between local varieties or breeds of *L. perenne*, including leaf length, rate growth and carbohydrate accumulation, flower induction and seed production (ROSSETTI, V., 2020), (GHARIANI, S., 2015), (ROSCHER, C., 2008). Seed germination plays an important role in the growth and development of forage plants, for that the most important factors are temperature, water content or length of day, and rapid growth, associated with the ability to persist through asexual reproduction (JAKUSEK, M., 2020), (BIRRER, M., 2014). Although it is a forage species with nutritional qualities, it is not persistent when used in mixture with other species and often disappears after the first year, giving the weeds the chance to invade the open space (KROPMAN E., & PETRA, M., 2018).

The impact of Lolium perenne adaptability on grassland characteristics

Temperate grassland ecosystems consist predominantly of grasses and legumes, such as *Lolium perenne* and *Trifolium repens,* and are often grown in combination due to the added value of atmospheric nitrogen fixation by *T. repens* (GREEN, D.S., 2019). Mixtures of *Lolium* and *Trifolium* are considered model systems in natural pasture and the most common matrix species in the natural pastures in Europe. The persistence and stability of the two species in mixed grasslands depend on the growing period, type of fertilizer, time and frequency of pressing (REN, H., 2017). Competition for N has been recognized as being of great importance in determining the balance between *L. perenne* and *T. repens* in mixtures, where it has been shown that under conditions of high nitrogen, *L. perenne* has a distinct competitive advantage over *T. repens* when these species are grown together (TALLEC, T., 2008). The high value of ryegrass is ensured primarily due to its germination and rapid establishment; however, it is a forage species that responds poorly to extreme temperatures. In regions where summers are hot and humid, perennial ryegrass is extremely susceptible to disease (CHANG, Z., 2017), often being infected with an endophytic fungus with the potential to affect the responses to abiotic stressful conditions. In some species the relationship is reported as dependent on environmental conditions and host genotype, (CHEPLICK, G.P., 2004), (SOTO-BARAJAS, M.C., 2019), (SCHUBIGER, F.X., & BOLLER, B., 2017). The use of resistant varieties is necessary especially

due to the tendency to minimize nitrogen intake, because the less nitrogen is applied, the more the crown rust invades the meadows where perennial ryegrass dominates (MUYLLE, H., 2005), (DRACATOS, P.M., 2009). The improvement of forage plants has improved the production potential, feed quality and functional traits of perennial ryegrass, and perennial ryegrass-based grasslands often contain many species of dicotyledons (legumes and non-legumes), (KOMAINDA, M., & ISSELSTEIN, J., 2020). *Lolium perenne* thus covers a wide range of environmental conditions (length of day, humidity, altitude, soil type, etc.), understanding the patterns and magnitude of genetic diversity in this allogamous species is a useful first step towards studying adaptability and useful selection. for more ecological features. All the more so as so far, Lolium's genomic resources have been relatively weak (BLACKMORE, T., 2015). Perennial ryegrass is thus productive and competitive, has high food quality, but is not resistant to winter compared to the more commonly used species of *Phleum pratense* and *Festuca pratensis*. If ryegrass dominates in the frosty structure of permanent meadows, the loss of this species during the winter would cause damage to the meadow, because through open holes would invade weeds (JØRGENSEN, M., 2019), due to low winter hardiness and lack of frost tolerance. Improving frost tolerance is an important target in breeding programs to expand the cultivated areas of perennial ryegrass in regions with severe winter (TAMURA, K., & YAMADA, T., 2007). The two species, *Festuca pratensis* and *Lolium perenne* have fascinated breeders, agronomists and evolutionists, because the two species are extremely productive, nutritious, persistent and well adapted, being used for agricultural and recreational purposes but also for stabilizing meadow soils suitable for increasing the quality and productivity of modern pastures. At present *Lolium perenne* is considered a very good species for grazing because it has high nutritional value and good regeneration, and *Festuca pratensis* is a complementary species because it is persistent and resistant to winter (GUO, Y., 2005), (MAJKA J., 2018).

The response of *Lolium perenne* to climate challenges

In the current conditions of arid climate in which permanent grasslands develop *Lolium perenne* have a special importance in terms of resistance to abiotic stresses. The ability of plants to "memorize" stress depends on the intensity of perceived stress and is related to the availability of water in the soil and the resistance of species to drought (NOSALEWICZ, A., 2018). Survival and high temperatures are two factors that threaten the productivity and stability, the factors interact with each other, so that as the temperature increases, the rate of transpiration in plants per unit of CO_2 absorption, leading to a reduction in water efficiency (NORTON, M.R., 2016). *Lolium species* have high digestibility, taste and intense growth in spring. These traits are important for adaptation to abiotic and biotic stresses, and tolerance to drought, winter resistance and fungal diseases. The desired traits of *Lolium* species can be combined with the traits of *Festuca* species by crosses and the green mass production of meadows can be increased by over-seeding with seeds from intergeneric hybrids *Festuca* × *Lolium* (*Festulolium*), (MAJKA, J., 2019), (MARSHALL, A.H., 2016), (HUMPHREYS, M.W.,

2018). Like all grassland-adapted species used for grazing, *Lolium perenne* is also a forage species adapted to defoliation, fertilization and growth cycles that rapidly change its carbon source and diving capabilities (AINSWORTH, E.A., 2003). Removal of photosynthetic tissues by defoliation by animals affects individual plants directly, by removing part of the active photosynthetic biomass (leaves and stems) or indirectly, by opening the canopy and subsequently decreasing above-ground competition (BENOT, M.L., 2019). Defoliation by grazing animals can have major effects on the structure and functioning of grassland ecosystems affecting shoot production and root rotation of plant communities, but also photosynthetic rates and carbon allocation in plants: energy flow in the plant-soil system (BAZOT, S., 2005). Raigras thus forms a dense root system with a role in stabilizing the soil by preventing the leaching of nitrates and pesticides into groundwater, erosion and landslides in hilly areas. Meadows are also home to numerous insects, including endangered species (SHARMA, H.S.S., 2011).

CONCLUSIONS

In conclusion, permanent grasslands and forage crops provide valuable ecosystem services to humans, also wild herbivores feed on forage plants and, therefore, these plants contribute to maintaining biodiversity, the extent and direction of associated ecosystem processes and services (LEE, M.A., 2018). In the last half century, due to the intensification of agriculture, the diversity of crops has been reduced, both in terms of field scale and landscape (LOWRY, C.J., 2020). Decreasing the diversity of ecosystem species can cause changes in the functioning of the ecosystem. The effects of species loss are still unclear and the consequences on community assembly and biotic interactions between trophic levels, such as predators, herbivores, mycorrhizal fungi, or infectious diseases, need to be further investigated (ROSCHER, C., 2007).

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