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Behaviour of Some Grasslands on the Slopes of the Balkan Mountain

By Dimitar Mitev

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When the grasslands are located on different habitats, the presence of a certain rhythm in the formation of the fodder mass is established. The yields were higher in the odd years (1995, 1997, 1999, 2001) in comparison with the even ones (1996, 1998, 2000). The sequence changed in 2002, 2004, 2006, 2008, 2010. The yields were again higher in the odd years (2011, 2013) than 2012.

The behaviour of the grasslands, located on slightly gleyed soils with eastern and southeastern exposure, follow the sequence mentioned above more clearly. Those in other habitats were accompanied by too much variety in their behaviour over the years and variants.

New elements are added to the various views and hypotheses on the origin of species, about their evolution and the causes of the behaviour of the grasslands.

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I. Introduction

Certain concepts have caused the import and wide use of foreign meadow species in Bulgaria (Mihovski and Yancheva, 1998; Stoeva 2001; Churkova, 2014, etc.). The grasslands that have been established do not meet the local habitat requirements, which results in their rapid degradation. A number of studies conducted in Bulgaria show the impossibility of creating quality and long-lasting meadow grasslands by imported seeds (Totev, 1984; Mitev, 1997; Stoeva 2001, etc.). That imposed the need to conduct a wide selection program for the creation of cultivars of local origin meeting the habitat conditions. Species of local origin are a considerable source of creation of new cultivars (Goranova-Naydenova, 2002; Mitev, 1997; Nedelnik et al. 2015). Many regions of the Balkan Peninsula in general, and Bulgaria in particular, include a number of secondary centers of formation, directly related to the main one of the Alps (Kozhukharov, 1986). This leads to the formation in Bulgaria of some of the richest natural and semi-natural communities in the world (Martinkova et al., 2018). The meadow species must correspond to the specifics of the habitat of the Central Balkan Mountain. Soils can be of heavy mechanical composition, with the presence of microelements, especially aluminum, in toxic concentrations, and subjected to erosion with carbonates on the surface (Palaveev and Totev, 1983).

The aim of the present study is to establish the persistence of some artificial meadow grasslands, located on the slopes of the Central Balkan Mountains, with different exposure to the main cardinal points of the world, characterized by slight and high degree of soil gleying.

II. Material and Methods

The experiment was conducted under the conditions of the foothill part of the Central Balkan Mountain, in the region of the town Troyan.

Picture 1: A panoramic view of the region – photo credit Peter Savov

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The grasslands are located on pseudopodzolic soils with slight and high degree of soil gleying, at high and low part of the mountain slopes, respectively (Penkov, 1998). The exposure to the cardinal points of the world is eastern, southeastern, northeastern, western, and northern. A scheme for ecological testing of local cultivars and populations of meadow grasses created in the region has been formed (Mitev and Belperchinov, 2000). The soils with a slight degree of gleying are characterized with $pH_{/KCl/}$ - 4.7; exchange cations in meqv/100 g soil: Al – 0.6-1.0; Mn-0.3-0.8; Ca + Mg – 0.9-11.1. The soils with a high degree of gleying are characterized with $pH_{/KCl/}$ - 3.9 - 4.0; exchange cations in meqv/100 g soil: Al – 1.3-1.6; Mn – 0.6-1.3; Ca+Mg – 3.6-4.5.

The experiment was set up in the spring of 1994, by the blocking method, in 4 replications, with the size of the experimental plot of 4 m^2. 800 germinable seeds per 1 m^2 were sown in soil that was brought to a garden state. The components in the mixed grasslands took up 1/2; 1/3; 1/4 of the seeding rates for a pure crop according to the variants. They were scattered by hand. Fertilizing was conducted in every other year with P80 $kg.ha^{-1}$ and K80 $kg.ha^{-1}$ since 1995, before the beginning of the vegetation of grasses in the area. The soil was fertilized on yearly basis with N80 kg.ha-^{1} since 1995 in the beginning of vegetation period of grasses. The grasslands were cut off when entering the phase of full tasseling - beginning of flowering for grasses and bud-formation - beginning of flowering for legumes. Dry matter yield was registered. Under circumstances beyond the control of the author, some of the habitats were harvested for a shorter period than indicated. The following types of grasslands were studied: 1 var. - red fescue - pure crop; 2 var. - red fescue + tall fescue; 3 var. - red fescue + Kenthucky bluegrass; 4 var. - red fescue + bird's-foot-trefoil; 5 var. red fescue + tall fescue + bird's-foot-trefoil; 6 var. - red fescue + Kenthucky bluegrass + bird's-foot-trefoil; 7 var. red fescue + Kenthucky bluegrass + alfalfa; 8 var. - red fescue + cock's foot + red clover + bird's-foot-trefoil. The seeds are of local origin with the exception of red clover ('Viola' cultivar) and cock's foot ('Dabrava' cultivar), which is Bulgarian (Mitev and Belperchinov, 2000).

A significant part of the results obtained over the years have been published periodically, using a different sequence and point of view of their interpretation (Mitev and Naydenova, 2014; Mitev and Naydenova 2015a; b; c; Naydenova and Mitev 2017; etc.)

The precipitation regime of the region has a continental character, but is strongly influenced by the Balkan Mountains. For a 35-year period (1965-1994), the average annual precipitation amount was 737.3 mm. In 1994, 1995, 1998 it was equal to the average for that region. In 1996, 1997, 1999, 2001, 2003, 2008, 2011, 2012, the precipitation amount was less compared to the average for the region. In 2002, 2004, 2006, 2007, 2009, 2010, 2013, it was higher. Significant differences were registered in 2000, when the precipitation was much less (520.3 mm) than the average for the region. In 2005, it was almost twice (1394.1mm). In spring, the precipitation amount was higher than in autumn. For the vegetation period (March-October), it was on average 599.7 mm. It should be noted that in 2000, precipitation was extremely small in the period March-October - respectively 244.4 mm.

The average annual temperature (1964-1994) for the region was +9.7^{0}C. During the vegetation period March-October it was +13.6^{0}C.

III. Results and Discussion

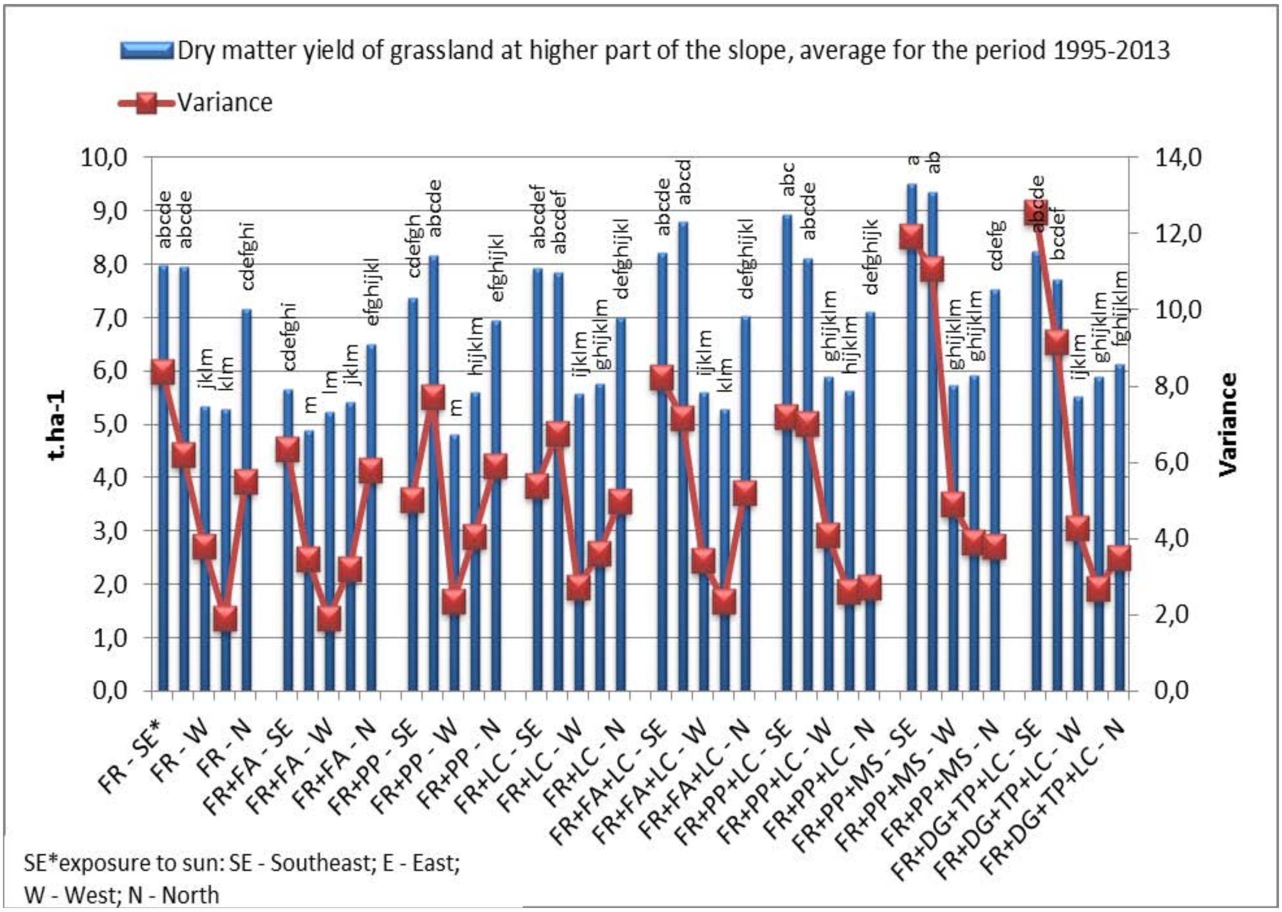
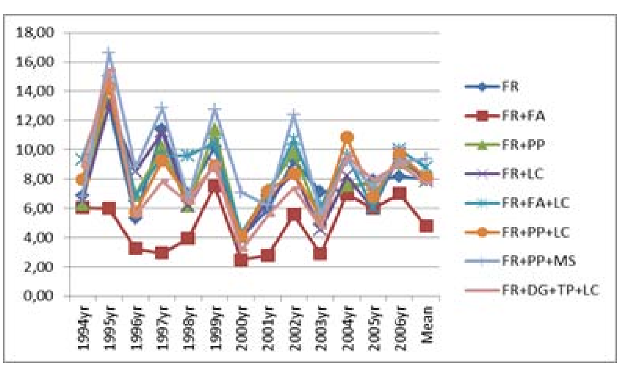


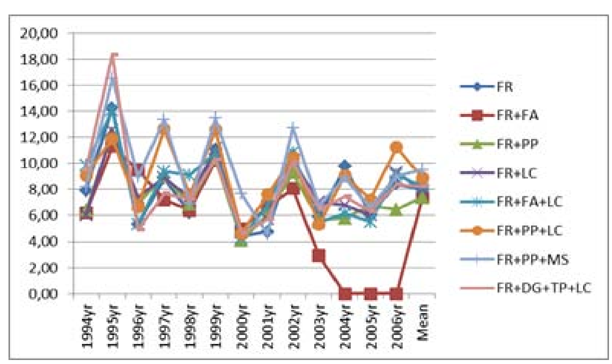
Figure 1: Dry matter yield of the grassland, slightly gleyed soils, high part of the slope, t.ha^{-1}, average for the period 1994 – 2013

On soils with a slight degree of soil gleying, high part of the slope, there were significant differences in productivity ($P < 0.05$) on average for the period depending on the exposure to the Sun (Figure 1).

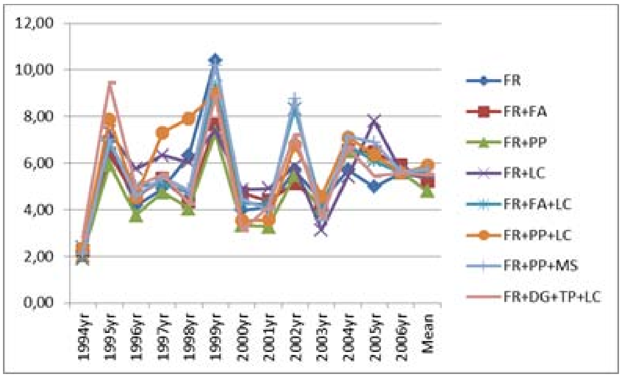
The highest average yields, but combined with a very high degree of variation over the years, were obtained by mixing red fescue with Kenthucky bluegrass and alfalfa, eastern and southeastern exposure of the slope. This mixture is most productive in the western exposure of the slope, slightly gleyed soils Slightly gleyed soils provide double mixtures of red fescue with bird's-foot-trefoil or Kenthucky bluegrass, a combination of high productivity with relatively high yield stability. On the western slope, eroded soils, the studied variants do not differ significantly in productivity. Under these conditions, the most stable yield was gathered from a pure crop of red fescue.



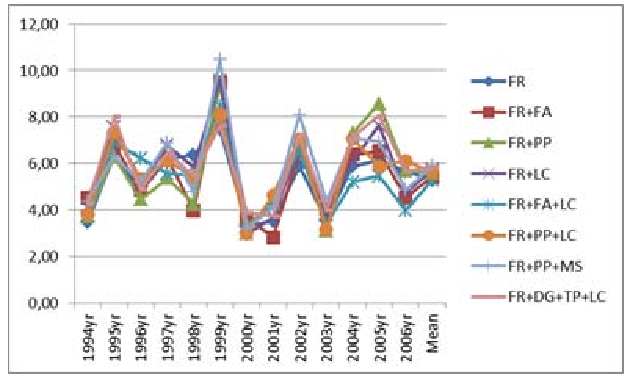
A) Eastern exposure, slightly gleyed soils (t.ha^{-1})



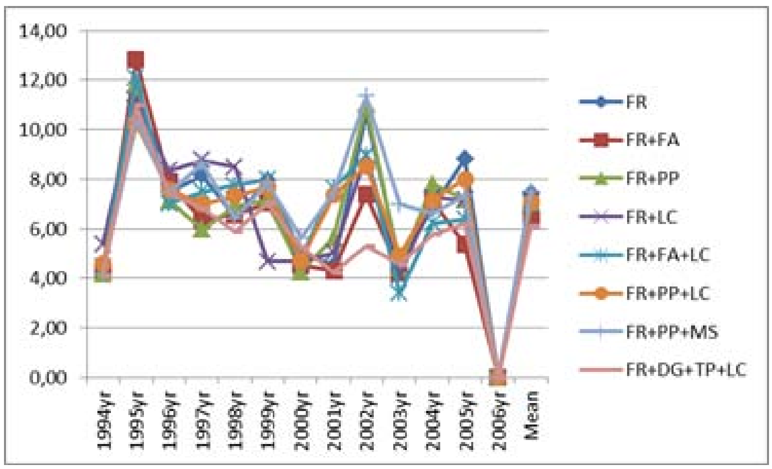
B) Southeastern exposure, slightly gleyed soils (t.ha^{-1})



C) Western exposure, slightly gleyed soils (t.ha^{-1})



D) Western exposure, eroded soils (t.ha^{-1})



E) Northern exposure, slightly gleyed soils (t.ha-^{1})

Figure 2: Dry matter yield of the grassland, slightly gleyed soils, high part of the slope, t.ha-1, by years in the period 1994 – 2013

The highest productivity was registered in the second year (1995) at eastern and southeastern exposure on slightly gleyed soils as it decreased gradually. A certain rhythm in the formation of fodder mass by variants over the years was found (Figure 2 a; b). The yields were higher in the odd years (1995, 1997, 1999, 2001) in comparison with the even ones (1996, 1998, 2000). The sequence of the rhythm of productivity changed. It was higher in the even 2002; 2004; 2006; 2008; 2010, compared to the odd 2003; 2005; 2007; 2009. The yields were again higher in the odd years (2011, 2013) than 2012. An example for that is the yield of red fescue, cock's foot, red clover and bird's-foot-trefoil (8th variant), at eastern exposure. The yield in 1995 exceeded that of 1996 2.8 times (Figure 2a). The excess in productivity at eastern exposure, of grassland of red fescue, tall fescue and bird's-foot-trefoil in 2001 (8th vegetation) compared to 2000 was 2.53 times. Occasionally, small deviations in trends are found in some grasslands during the years of study At the southeastern exposure (Figure 2b), the yield from the mixed grassland of red fescue, Kenthucky bluegrass and bird's-foot-trefoil in 2000 (7th vegetation) was 7.64t.ha^{-1} and exceeded 2001 (4.57 t.ha^{-1}) At eastern exposure, the grassland of red fescue and Kenthucky bluegrass exceeded 2.6 times the productivity in the even 2008 compared to the odd 2007 (Figure 2a). On average over a 20-year-period (1994–2013), the productivity of pure crop of red fescue, at southeastern exposure, slightly gleyed soils was equal to that of mixed grassland of red fescue and Kenthucky bluegrass, as well as red fescue, tall fescue fescue and bird's-foot-trefoil (Figure 1).

The highest productivity was registered after 2000 at western exposure of the slope, slightly gleyed soils, in comparison with the previous period (1994-1999) (Figure 2b).

An exception is found in the grassland of red fescue, cock's foot, red clover and bird's-foot-trefoil. It reached the highest productivity (9.45 t.ha^{-1}) in the second year since the beginning of the experiment (1995). In the period 2004-2006, the productivity was significantly equal in this habitat.

At western exposure, eroded soils, the difference in productivity between even and odd years was less pronounced in the period up to 2000-2001 than in the following years (Figure 2d). In 2005 – 2006 a significant closeness was found in the productivity of grasslands.

The comparison of the productivity obtained from the grasslands at western exposure, located on slightly gleyed soils (Figure 2c) with those subjected to erosion (Figure 2d) shows a peculiar specific behaviour. On eroded terrains the conditions for growing grasses are significantly more unfavourable. It is expected that their productivity will be lower than that obtained at the same exposure, but on poorly gleyed soils. In the latter, the soil layer is significantly more powerful, with greater moisture capacity and moisture retention, and nutrients are more. At the western exposure discussed here, the largest excess in the productivity was registered in the mixed grassland of red fescue and Kenthucky bluegrass on eroded soils, in comparison with the slightly gleyed ones. In a single year (2000), their yields were equal for both habitats. Similar behaviour was found in the grassland of red fescue, cock's foot, red clover and bird's-foot-trefoil. Over the years, the productivity of a pure crop of red fescue; red and tall fescue; red fescue and bird's-foot-trefoil; red fescue, tall fescue and bird's-foot-trefoil, located on eroded soils was greater than that on poorly gleyed ones. The highest productivity was gathered from the grassland of red fescue and bird's-foot-trefoil at both habitats with western exposure (Figure 2 c; d). On poorly gleyed soils it (7.81 t.ha^{-1}) was obtained in 2005 (12th harvest year). On eroded soils (7.57 t.ha^{-1}), it was in the 6t^{h} year since the beginning of the experiment. The average productivity (Figure 1) of grassland of red fescue, Kenthucky bluegrass and bird's-foot-trefoil was higher on the western slope, slightly gleyed soils, compared to that on eroded soils. The productivity of red fescue, Kenthucky bluegrass and alfalfa over the greater number of years of the study was higher on eroded soils, western slope (Figure 2d) compared to slightly gleyed, at the same exposure (Figure 2c). Their average productivity for the period is absolutely equal (Figure 1).

At northern exposure, slightly gleyed soils (Figure 2e), the highest productivity was in the second year (1995) since the establishment of the grasslands. In the following years, a relative similarity in productivity was established by variants. There are some exceptions: Yields from the mixed grassland of red fescue and Kenthucky bluegrass in 1995 (2nd vegetation) and those in 2002 (9th vegetation) were close (11.79 t.ha^{-1} and 11.02 t.ha^{-1}). The highest productivity (11.35 t.ha^{-1}) of the mixed grassland of red fescue, Kenthucky bluegrass and alfalfa was found in the 9th vegetation (2002) since its creation.

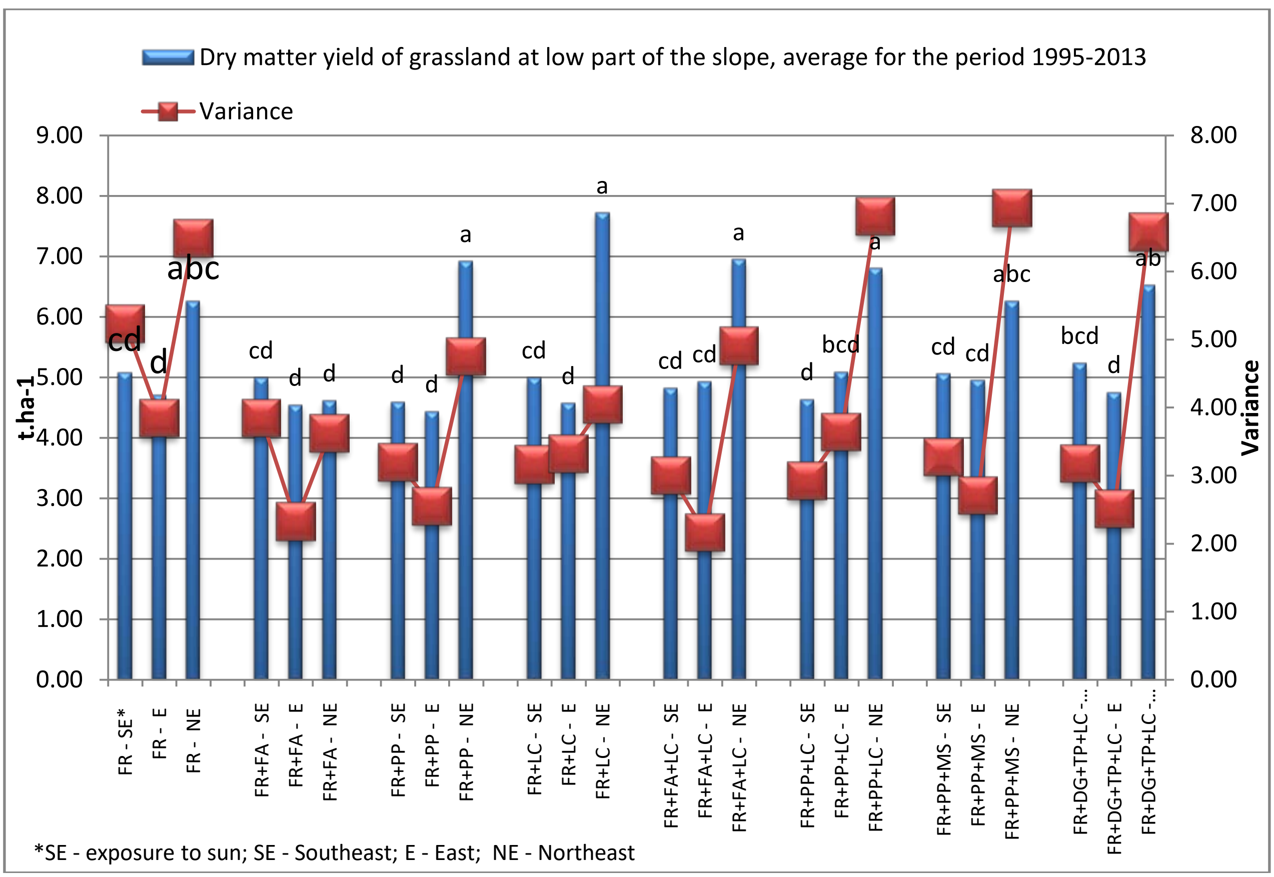


Figure 3: Dry matter yield of grasslands, highly gleyed soils, low part of the slope, t.ha^{-1}, average for the period 1994-2013

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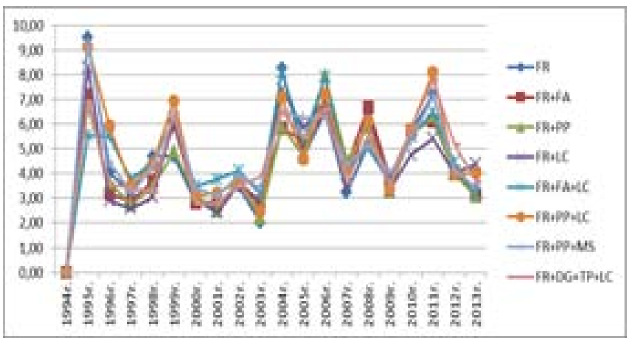
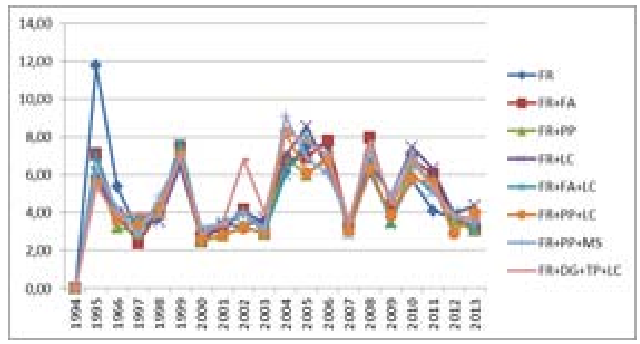
The average productivity of grasslads located on highly gleyed soils (Figure 3) was lower (P <0.05) compared to soils with a low degree of soil gleying (Figure 1). An exception was found in the mixed cultivation of red fescue with tall fescue. The location of grasslands, containing Kenthucky bluegrass and bird's-foot-trefoil on highly gleyed soils, low part of the slope has a significant impact on productivity, depending on its exposure to the Sun (Figure 3).

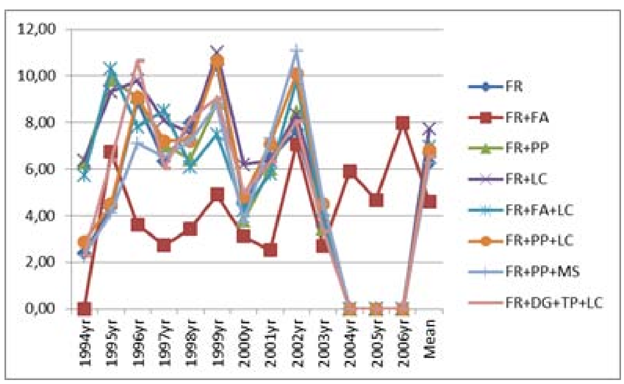
The yields of grasslands on highly gleyed soils, at northeastern exposure, are significantly higher than at eastern and southeastern locations, with the same level of soil gleying (P <0.05) - (Figure 3). At the same time, the highest variation under the influence of different conditions over the years was at the northeastern exposure. The double mixture between red fescue and bird's-foot-trefoil combine high productivity and relatively high yield stability. With a high degree of gleying, a low part of the slope, the increase in the number of components in the grassland, as well as the use of other legumes (red clover or alfalfa) did not contribute to yield stability over the years. It can be considered that under these conditions the variation in productivity over the years can be significantly reduced by growing red fescue in mixtures.



A) Eastern exposure, highly gleyed soils (t.ha^{-1})



B) Southeastern exposure, highly gleyed soils (t.ha-^{1})



C) Northeastern exposure, highly gleyed soils (t.ha^{-1})

Figure 4: Dry matter yield, t.ha^{-1}, highly gleyed soils, low part of the slope, by years in the period 1994-2013

The sequence in the behaviour of grasslands in highly gleyed soils at lower part of the slope (Figure 4), in terms of alternating the level of productivity in even-odd years, was better expressed after the year 2000. There is a certain variety of variants and years, different from the established one, especially in soils with low gleying, eastern and southeastern exposure (Figure 1).

At the eastern exposure, highly gleyed soils productivity in 1997 was lower than in even 1996 and 1998 (Figure 4a). The pure crop of red fescue was most productive (9.5 t.ha^{-1}) in 1995 (2nd vegetation). The same is found for the grassland with red fescue and tall fescue (7.18 t.ha^{-1}), as well as for red fescue and bird's-foot-trefoil (8.29 t.ha^{-1}); redi fescue, Kenthucky bluegrass and bird's-foot-trefoil (9.13 t.ha^{-1}); red fescue, Kenthucky bluegrass and alfalfa (9.26 t.ha^{-1}). The mixed grassland of red fescue and Kenthucky bluegrass was the most productive (7.97 t.ha-^{1}) in 2006 (13th vegetation), while that one with red fescue, tall fescue and bird's-foot-trefoil (8.10 t.ha^{-1}) in 2004 (11th vegetation). In the seven-year period (1994-2000), the pure crop with red fescue had lower average productivity in comparison with the grassland with red fescue, Kenthucky bluegrass and bird's-foot-trefoil, as well as the one with red fescue, Kenthucky bluegrass and alfalfa. In the period 1994-2006 (13 years), the pure crop of red fescue was compared to the grasslands of red fescue, Kenthucky bluegrass and bird's-foot-trefoil on the one hand, red fescue, tall fescue and bird's-foot-trefoil on the other, as well as red fescue, Kenthucky bluegrass and alfalfa.

Compared to other grasslands, its productivity was higher. The pure crop of red fescue, at eastern exposure, highly gleyed soils (Figure 3), formed more dry matter on average for the period 1994-2013 (20 years) compared to the mixed grasslands with tall fescue, Kenthucky bluegrass or bird's-foot-trefoil. Similar behaviour was found in the grassland of red fescue, cock's foot, red clover and bird's-foot-trefoil.

At southeastern exposure, highly gleyed soils, in most of the variants, the highest productivity was reached in the period 2004–2008 (11^{th}-15^{th} vegetation) (Figure 4b). Over the years 1996-1998 the productivity was very low, and in 1997 was the lowest. The pure crop of red fescue was most productive (11.74 $t.ha^{-1}$) in 1995 (2^{nd} vegetation). The highest productivity was gathered (7.50 $t.ha^{-1}$) from the mixture of red fescue and Kenthucky bluegrass in 1999 (6^{th} vegetation). Grasslands of red fescue, Kenthucky bluegrass and bird's-foot-trefoil; red fescue, Kenthucky bluegrass and alfalfa; red fescue, cock's foot, red clover and bird's-foot-trefoil were the most productive (respectively 8.26 $t.ha^{-1}$, 9.09 $t.ha^{-1}$, 8.31 $t.ha^{-1}$) in 2004 (11^{th} vegetation). The grasslands of red fescue and bird's-foot-trefoil, as well as of red fescue, tall fescue and bird's-foot-trefoil were most productive (respectively 8.53 t.ha-1, 7.96 $t.ha^{-1}$) in 2005 (12^{th} vegetation). The mixed grassland of red and tall fescue reached its maximum productivity (7.97 $t.ha^{-1}$) for the habitat conditions in 2008 (15^{th} vegetation). At this exposure of the slope, the pure crop of red fescue gave on average for the period 1994–2000 (7 years) and for 1994–2006 (13 years) more dry matter than all other grasslands included in the study. In the period 1994-2013 (20 years), the mixed grassland of red fescue, cock's foot, red clover and bird's-foot-trefoil gave (average) the highest yield of dry matter (Figure 3).

At the northeastern exposure, highly gleyed soils, low part of the slope, the predominant part of the variants realized their maximum productivity in the first half of the period covered in the study (Figure 4c). The mixed grasslands of red fescue and Kenthucky bluegrass, as well as of red fescue, Kenthucky bluegrass and bird's-foot-trefoil were the most productive (respectively 9.85 $t.ha^{-1}$, 10.31 $t.ha^{-1}$) in 1995 (2^{nd} vegetation). The one of red fescue, cock's foot, red clover and bird's-foot-trefoil (10.65 $t.ha^{-1}$) in 1996 (3^{rd} vegetation). The pure crop of red fescue (10.48 $t.ha^{-1}$), also the mixed grasslands of red fescue and bird's-foot-trefoil (11.01 $t.ha^{-1}$), as well as of red fescue, Kenthucky bluegrass and bird's-foot-trefoil (10.6 $t.h^{a-1}$) reached its maximum production in 1999 (6^{th} vegetation). In 2002 (9^{th} vegetation), it was found in the mixed grassland of red fescue and tall fescue (7.07 $t.ha^{-1}$), as well as in red fescue, Kenthucky bluegrass and alfalfa (11.06 $t.ha^{-1}$).

When located on a northeastern slope, highly gleyed soils, the pure crop of red fescue exceeded the average productivity of mixed grassland of red fescue and tall fescue, as well as red fescue, Kenthucky bluegrass and alfalfa for the period 1994-2000 (7 years). For the period 1994-2006 (13 years), the excess was only in the mixed grassland of red and tall fescue (Figure 4c).

The Earth as part of the system of the Universe is subjected to a constant energy impact, with a certain rhythm (Wong, 1997; Baggot, 2000; Madzharov et al, 2002, etc.). It could be assumed that the components of the environment, in this case soil differences with the respective biotic and abiotic part, diversity in sunshine, moisture irregularity, etc. treat this impact accordingly. Tracking the results in the present experiment, as well as those described in our other publications (Mitev and Naydenova, 2016; Mitev and Yasheva 1998; Naydenova and Mitev 2010 a; b, etc.) creates the impression of a kind of "pulsation of the systems". It is different, as a manifestation over the years, for each of the variants and is probably caused by the synchrony or lack of such with the rhythm in Nature, with its energy essence. This topic is discussed in a previous publication (Mitev and Naydenova, 2016). There is a certain interest in connection with the established change in the rhythm of productivity, especially in eastern and southeastern exposure, slightly gleyed soils. It is within a ten-year period, which coincides with that of the calendar. Unfortunately, the available results are very limited, but they are a great challenge.

Of particular interest are the results obtained at the southeastern exposure of the slope, highly gleyed soils for a 20-year period (1994–2013). Pure crop of red fescue was superior in productivity than a large part of the variants covered in the study. Only the grassland of red fescue, cock's foot, red clover and bird's-foot-trefoil surpassed that. The discussion on the advantages and disadvantages of simple (Mitev and Petrov, 1999) and complex (Hector, 1998) mixed grasslands and their comparison with pure crops has had a long history (Darwin, 1872; Mitev and Petrov, 1999; Naydenova and Mitev 2010a etc.). It has continued over the years with unceasing power (Sanderson et al., 2004). In this case, the species composition at the period of sowing the grassland is observed, and not the actual during the years of study. In the initial period of the study (1998-1999) cock's foot and red clover fell out of the grassland. The forage mass predominantly consists mainly of red fescue, self-sown bird's-foot-trefoil and some other meadow grasses of local origin (Mitev and Naydenova 2015b). In line with our previously developed hypothesis, some of the environmental factors may remain inaccessible for use by plants conditionally forever. Under specific conditions, this access could be increased. This determines productivity, grassland composition, development sustainability, self-recovery, etc. (Mitev, 2004; Mitev and Naydenova, 2012). It is supposed that the comparison in productivity of grasslands, especially in the behaviour of the mixed one of red fescue, cock's foot, red clover and bird's-foot-trefoil, verifies the hypothesis above. The reasoning in this regard can be supplemented by the understandings of Hensel, (1892) on the specifics of mineral nutrition in plants. The factors of impact (soil, climate, space, ...) on the plants definitely differ depending on the exposure and the location on the slope. Within each specific habitat, they are the same. What then forms the variety of behaviour by variants? We assume that the results discussed here are indicative of how species relationships affect the behaviour of grasslands (Schmid, 2002). A point of discussion is what is decisive in this case: Do the relationships between plants affect the consumption of environmental resources (Bostan et al. 2012; Virteiu, Ana Maria, 2015, etc.), or their consumption shapes them (Luo et al. 1995). Synthesis of allelopathic compounds requires the availability of sufficient energy and nutrients in plants. If these by-products can change the conditions for competition and those of the environment, they are obviously of evolutionary importance. Luo, 2005). There are authors who categorically reject the role of allelopathy in the relationship between plants (Delgado et al., 2014). One-sided research plays an important role in this case. There are many researchers who focus only on allelopathy, others on the struggle for environmental resources, etc. The complexity of the processes requires the combined efforts of biochemists, ecologists, molecular biologists, microbiologists, soil scientists and others. researchers. The nature of the study will determine the type of cooperation required (Romeo, 2000; Inderjit and Callaway, 2003).

We could refer in our reasoning to our hypothesis that each “structural unit” (... species, population, variety, ...) is a “unique projection in Time” (Mitev, 2004; Mitev and Naydenova, 2012). We definitely believe that the diversity in the behavior of plant material is due to differences in this regard. It is perfectly acceptable for the interaction between them to take place on a “time level”, with all the ensuing consequences (Mitev and Naydenova, 2014; 2015b).The "time resource" available to the "structural units" probably determines their behavior in the specific habitat, the consumption of environmental factors, the exchange of biologically active compounds, the result of their physiological activity, etc. We believe that time in the organismic world is relative and differs from its physical size. The change in its "configuration" causes an adequate response in the genome of organisms and their corresponding state. In this way, the realization of a kind of "guided natural selection" could be influenced. This idea has been discussed in some publications (Borza and Coste, 2002 – as quoted by Bostan et al. 2012); Evans et al., 1989; Mitev and Yasheva, 1998), but now receives a specific interpretation. The emergence of “a barely noticeable force of selection with regard to the specificity of the neighbours” (Turkington et al., 1977) is probably in line with this idea. Each community can only be composed on the basis of interacting coexistently selected individuals (Borza and Coste, 2002 – as quoted by Bostan et al. 2012). Probably this is an opportunity to get an answer to the question "how and what hereditary information is transmitted in time." (Mitev and Yasheva 1998).

In the meadow communities there are others besides the desired grass species. In the experiment described here at eastern and southeastern exposure, slight soil gleying, *Centaurea jacea* L. became widespread. In highly gleyed soils, on slopes with this exposure, *Pilosella alpicola* (Steud. & Hochst.) F.W. Schultz & Sch.Bip.) was spread. With regard to both species, we could add that in the period 2015-2016 Pilosella alpicola fell out of the grasslands. In the period 2018-2019, *Centaurea jacea* L. significantly reduced its share in the total fodder mass (Mitev $_{(1)}$ unpublished). It is known that under the influence of biologically active compounds isolated from other species belonging to the genus *Centaurea* (*Centaurea maculosa* Lam.; *Centaurea diffusa* Lam.), there was a change in the genome of the neighboring meadow species receiving them. In this way, their basic life processes are blocked. Thus Bais et al. (2003) argued against the traditional understanding of the role of allelopathy mainly in the field of competition for environmental resources. It could be assumed that the same occurs in the interaction between the individual meadow species, as a result of the biologically active compounds they release with allelopathic effect. The influence of weeds on cultivated species is usually studied (Ali Zohaib et al., 2014) and less often the opposite (Georgieva and Kirilov, 2016). We could refer to the author's understanding that each "structural unit" is a kind of "energy information system" (Mitev and Naydenova 2015b), which in the conditions of formed communities enters into certain interactions with others, according to the rhythm in Nature, which determines the general status.

There are some interesting arguments of Borza and Coste (2002) (as quoted by Bostan et al. 2012), that the interactions among plants can be achieved at least in three aspects: substantial, energy, and informational. The most important aspect seems to be the substantial for two reasons: 1) because substances in the developing interaction can provide energy and information; 2) because in any case, at a certain moment of information impact, each signal is transformed into a changed molecular structure of life. We could focus on the understanding of the energy information impact of DNA on the state of higher organisms (Garyaev, 1997). It is believed that the strength of energy information fields exceeds that of the genetic code (Lazarev, 1996). Information, in a slightly broader sense, passing into matter gives birth to energy. Energy becomes a substance that strives to accumulate energy and information. All this is within a natural cyclic sequence (Lazarev, 1997). Information, similarly in

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another aspect, as an enigma is not matter, it is not energy, but it is a carrier of matter and energy. In deeper terms, it is a quantum-elative self-carrier of matter and energy (Mateev, 2004). Water receives, preserves and transmits information (Emoto, 2006). It is well known that it prevails in the cells (in this case) of plants. It is believed that its chemical formula (H_2O) contains and exhibits only part of a number of its specific properties (Danov, 1940, quoted by Mihailov, 2002). It can be focused on the idea of the energy information impact of DNA (Garyaev, 1997), and then that the energy information fields are inherent in biological beings (Lazarev, 1996). “The manifestations of Time and Space are mutually determining and are an inseparable relation within them. In order to understand the essence of the biofield, it is necessary to establish the difference between living space and non-living space. It turns out that it is possible to approach their study as a phenomenon that has a structure (Vernadsky, 1975). The essence is that "all living beings form a thin biological layer in which they interact." In addition to what has just been presented, the understanding can be formed that their biofield contains information about Evolution that took place in Time. Thus, a more comprehensible form is presented about the understanding shared in a previous publication that “(theoretically) Evolution can be repeated” (Mitev and Naydenova, 2012). On a more general (universal) level, existing information could materialize again under certain circumstances.

We suggest the reader, taking into account one’s own understanding of the essence of Nature, to reflect on the thesis of Borza and Coste, (2002) (quoted in Bostan et al. 2012), enriched with that of Bais et al., (2003) and added by Garyaev, (1997); Lazarev, (1996; 1997); Mateev, (2004), including the discussion moment in this publication.

IV. Conclusions

When locating grasslands on habitats with different exposure of mountain slopes to the main cardinal points of the world and a variety of soil gleying, the presence of a certain rhythm in the formation of the fodder mass is found. The yields were higher in the odd years (1995, 1997, 1999, 2001) in comparison with the even ones (1996, 1998, 2000). The sequence changed in 2002, 2004, 2006, 2008, 2010. The yields were again higher in the odd years (2011, 2013) than 2012.

The behaviour of the grasslands, located on slightly gleyed soils with eastern and southeastern exposure, follow the sequence mentioned above more clearly. Those in other habitats were accompanied by too much variety in their behaviour over the years and variants.

New elements are added to the various standpoints and hypothesis on the origin of species, about their evolution and the causes of the behaviour of the grasslands.

If each "structural unit" (…, species, population, variety, …) is a "kind of projection in Time", then it is perfectly permissible for the interaction between them to take place at the "time level", with all the ensuing consequences. It is supposed that it allows to realize "a guided natural selection"? The "time resource" available to the "structural units" probably determines their behavior in the specific habitat, the consumption of environmental factors, the exchange of biologically active compounds, the result of their physiological activity, etc. We believe that time in the organismic world is relative and differs from its physical size. The change in its "configuration" causes an adequate response in the genome of organisms and their corresponding state.

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