PHYTOINDICATION FALLOW TRANSFORMATION UNDER THE INFLUENCE AFFORESTATION

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The results of the study succession of live coverage of ground conducted in the age range of pine plantations established on fallow . Environmental Assessment conducted by analyzing geo-botanical descriptions by the method synphytoindication . The regularities of the transformation processes of environmental and received scoring as listed in the absolute values that characterize the trend of transformation of fallow as a result of afforestation in time.

Keywords: afforestation , Culture pine, fallow , transformation, phytoindication , succession, grass cover.

Relevance of increased attention to the science of ecological functions of forest stands as an object of research in ecology due to the need to optimize the structure of agricultural landscapes because of the increasing human pressure on the environment, due to unduly high proportion of cultivated area of the country, and the presence of large areas of land withdrawn or unsuitable for future agricultural use. The problem associated with the growth of the share of fallow does not meet the rational use of land resources requires scientific and reasonable way to solve it. One way of effective use of bio-ecological potential of these areas , along with simultaneous restoration of natural balance anthropogenically disturbed land is afforestation , which makes two interrelated processes - the succession of ground vegetation and soil processes [5]. Therefore the question and attempt to figure out the dynamics of the transformation of the land at the time under the influence of forest stands of different ages. Some results of research on the transition fallow under the influence of afforestation is given in [3, 5]. In particular, in [3] contains some results of determination of physical and chemical

characteristics of the soil in the laboratory , which makes it impossible to fully assess or predict the type of site conditions and features of the transformation of the environment.

Since it is known that the structure phytocenotic grass can be an indicator of the transformation of the environment in this study was an attempt to clarify the change in condition of the soil as a result of afforestation on fallow fitoindykatsiynym method. Phytocoenotic structure of grass recovers much faster than the structure of the stand , as the generational change of herbal plants is more than trees, because the ground cover that adapts very quickly to changes in abiotic and biotic factors, a reliable indicator of transformation environment [4].

Due to the fact that the dynamics of the transformation of the living ground vegetation on fallow Kiev Polessye influenced by afforestation poorly studied, a series of comprehensive studies of the living ground vegetation succession in age row pine plantations established on fallow. For this analysis the composition of grass in pine plantations of different ages, established on fallow and evaluated the dynamics of changes in plant communities by edaphic and climatic factors that accompany this process.

Materials and methods research

The study of general trends in changes of ground vegetation during reforestation to fallow was to determine the characteristics of the succession of plant communities in pine cultures of all ages.

To this end was made geobotanic description of research areas and a study of species diversity, ecological and structural characteristics of vegetation. We investigated the grass cover for 5 test areas - fallow, 10, 24, 58 and 100 years old pure pine plantations established on fallow Kiev Polissja.

The place for research served as research sites with identical soil and climatic and geomorphological conditions size 0,25-0,35 ha laid on typological basis in forest plantations of Scots pine (Pinus sylvestris L.), on land withdrawn

from agricultural use. Served as a control site - fallow , formed in areas removed from agricultural use since 1986. Lots placed in a uniform , typical areas of Kiev Polessye, landscape and within close range of each other and some border on one another . Sod- podzolic soil , sandy fluvioglacial sediments in which underlain by loamy moraine . The object of the study was the vegetation within the five test sites that are identical in vivo.

Plots laid in forest plantations in different years to create and fallow according to conventional forest inventory method, as well as the geo-botanical techniques. Environmental Assessment communities conducted by analyzing geo-botanical inventories made in 2010 using the method phytoindication [1] and calculated using "Sphyt", received scoring listed in absolute values [2].

To determine the specific terms of habitat conducted analysis on the 10-th environmental factors: soil moisture (Hd), soil acidity (Rc), common salt regime (Tr), the content of assimilable forms of nitrogen (Nt), content of carbonates $Ca2+$ and $Mg2+$ (Ca), termorezhym (Tm), kriorezhym (Cr), continental (Kn). The research results are analyzed and calculated by a computer database Excel 2007 and established the distribution of values for each environmental factor.

The research results

The analysis of the experimental data revealed that with increasing age plantations reduced species diversity, abundance and projective cover of grass. In Fig. 1. showing the changes in species diversity of grass vegetation with increasing age plantations.
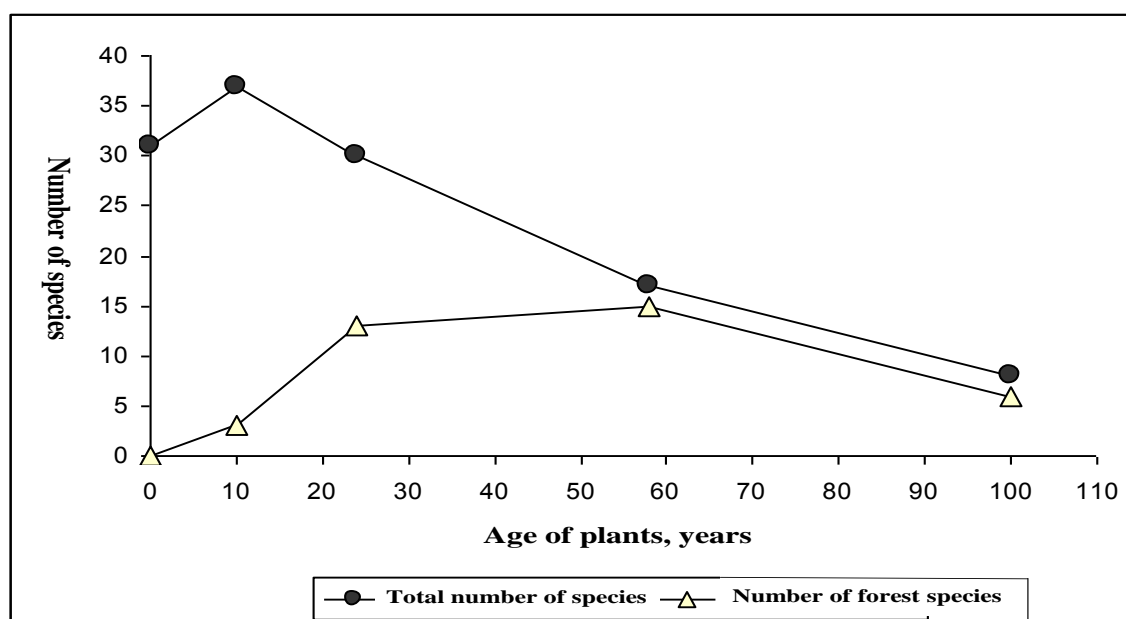
Figure 1. Dynamics of species diversity of grass depending on the age of plants

As can be seen from the figure in the grass cover of pine plantations seen a significant increase in the proportion of forest species, for the 10 -year-old plantation forest species share is 8 %, 24 -year-olds - 40%, 58 -year-olds - 76 %, and for 100 years - 88 %. Analysis of transformation groups showed a decline of pine species diversity of herbaceous plants and reducing the projective cover of grass , due to a high degree of closure crowns , causing shading the soil surface , reducing light levels , reducing soil temperature . Closing crowns defines unfavorable light conditions for growth and development of grass vegetation. Significant influence has accumulation of forest litter layer , which prevents the development of grass .

Evaluation of test plots by edaphic and climatic indices showed slight changes of values of key environmental factors examined in five areas. Method the average score is defined indicators of environmental regimes that represent the process of formation of the forest environment changes ecotypes under the influence of forest plantations. Dynamics parameters edaphic factors are shown in Figure 2.

Interactions between soil and vegetation affect the nature of soil . Drastic changes of vegetation, which took place after the establishment of forest plantations on fallow effect on soil recovery processes . In relation to water regime (Hd) investigated areas are characterized by mesophytic conditions with plants fresh forest meadow ecotypes full soak root layer soil sediments and meltwater . So the smallest value Wpr (coefficient moisture to the root layer of soil) characteristic plot fallow and 10 -year-old pine plantations (about 100 mm), and other areas of soil moisture slightly higher (up to 150 mm).
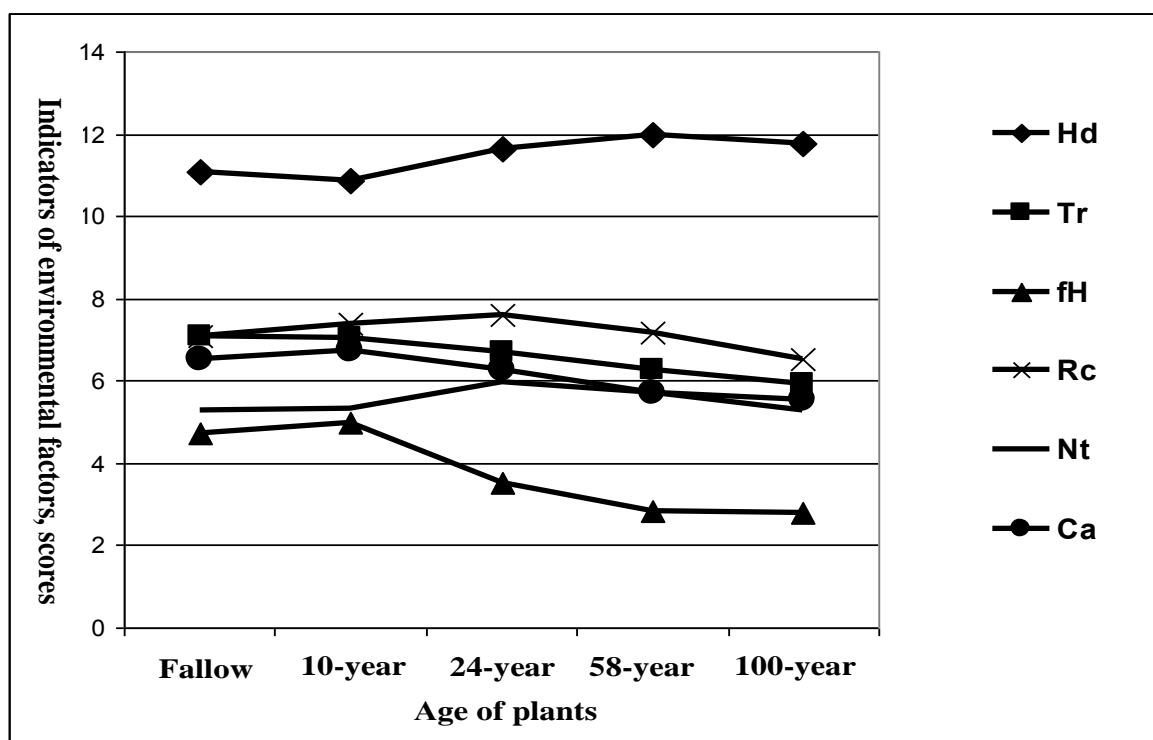

Figure 2. Change to edaphic factors (Hd - humidity, Rc - soil acidity, Tr - common salt regime, Nt - content of digestible forms of nitrogen, Ca - content of carbonates in the soil).

The nature of the water regime well describes the variability moisturizing factor (fH). Fluctuations factor values ranging from 2.5 to 5.0 points characterizing researched area in terms of plant growth of ecotypes with uniform moisture resistant root layer soil groundwater and surface waters in part (by a factor of uneven wetting of $\omega = 0,06$) (section 3, 4 , 5), to dry ecotopes , topsoil are moistened sediments (up to $\omega = 0,15$) (platforms 1 and 2). This distribution of the

environmental factors are quite logical, since the first two sections represent areas with immature vegetation , mostly synanthropic and not shaped tiers, no moss layer , which performs an important role in atmospheric moisture retention and soil structure broken . This complicates the accumulation and efficient allocation of water received in communities .

An important environmental factor is the acid soil treatment (Rc), which depends on the chemical composition of soil, rocks soil flushing regime and the type of vegetation. For the acidity of the soil studied objects are characterized by acidic soils with a pH 5,5-6.5. The lowest value of soil acidity observed for area 24-year-old pine plantations, and most of all - for 100 years.

In terms phytoindication analyzed as total salt regime (TR), which is an important characteristic of soil because it has a significant impact on soil processes and defines the adaptation of plant organisms. The gradient salt regime marked a clear direction of change factor values of fallow and 100-year-old stands in the direction of salt depletion in soil from 200 to 150 mg / l with a high content of HCO3 (4-16 mg/100 g soil).

For the factor content of digestible forms of nitrogen in the soil (Nt) we got value within one point. Attention is drawn to the fact that the greatest value of this factor observed for the 24-year-old stands. This can be explained by the fact that at this formative stage coenosis pine forest in the formation of grass stage involved a significant proportion (at least 25%) Eksplerent species, including species nitrofily (Urtica dioica), and legumes that improve the nitrogen content in soil.

On a scale of carbonate content in the soil (Ca) investigated area is characterized as neutral ecotopes withstand minor carbonate content in the soil (1%) and have a narrow amplitude at one point.

Climatic factors (Fig. 3) play a lesser role than the differential edaphic , as the model studied areas were considered in similar conditions , sometimes bordering each other and calculate the impact of climatic factors are built on

common parameters for model areas (radiation balance, temperature, amount of precipitation) and not due to site conditions . Factors , where the values are different components (snow, evaporation) may have a role in differentiating display of model sites.
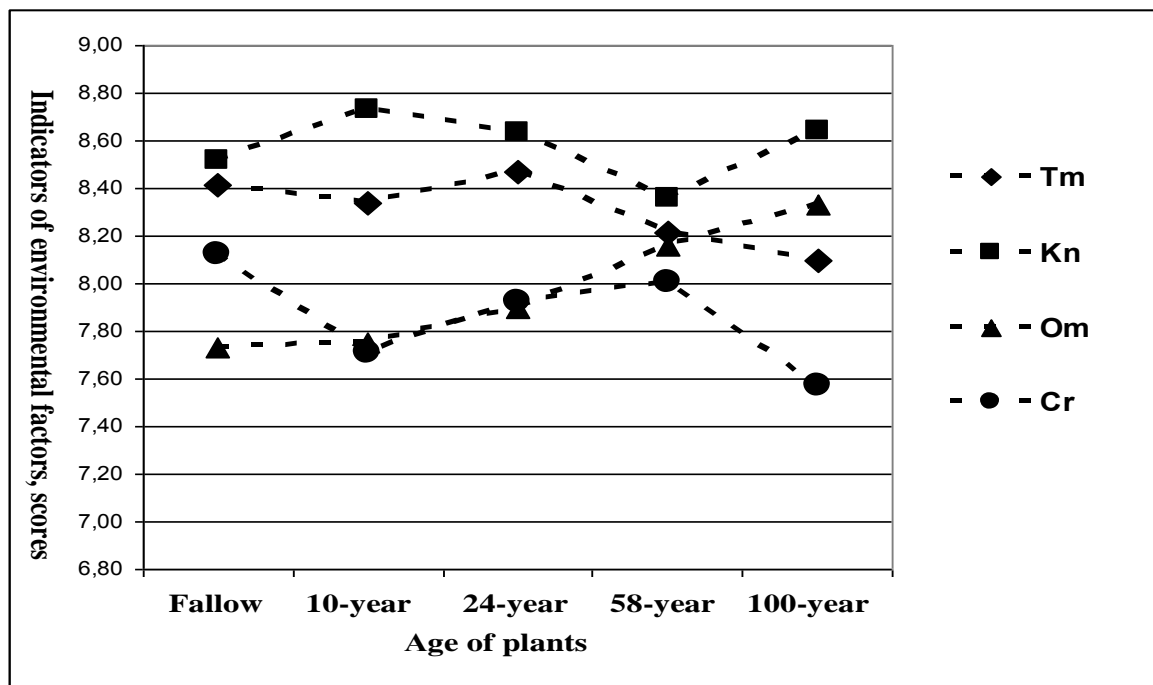

Figure 3. Dynamics of changes in climatic factors, depending on the age of plants: (Tm) - thermal treatment, (Cr) - cryo treatment, (Kn) - continental, (Om) - Ombre mode.

Ombre mode is defined as the difference between annual precipitation and evaporation. At the same value of the first parameter, the second is much different, because of the difficulty of evaporation in forest plantations compared to open areas. In our case the value Ombre mode increases with age pine plantations, although within one point (-1000 - 800 mm), which corresponds to the arid climate.

Using the values of other factors together fashion sites differ only in the number of statistical error. The data showed that the most important factor for thermal treatment at 1 cm^2 for 40 kkal.sm^2. year^{-1}, corresponding to environmental group sub micro terms. This level of radiation balance is one of the smallest to the

territory of Ukraine. The investigated area lies within the hemi continental climate (121-130% continental climate). Over the range of tolerance cryo treatment studied area corresponds to the environmental characterization subkriofitu with an average temperature of the coldest month -12 - 10 ^{0}C.

Conclusions

As a result of afforestation on fallow gradually transfer grass meadow vegetation in the shrub-wood. Since 24 years of age increased height and vertical closure of pine plantations in the stands begin to form distinctive microclimate: under the canopy reduced light level, humidity, soil temperature, which in turn stimulates the development of moss cover and inhibits the development of grass vegetation. As a result of the establishment of forest plantations gradually decreasing percentage of ruderal and meadow species, grass growing range of percentage of forest and steppe species, indicating the formation of the typical environment of forest ecosystems.

Analysis of vegetation in the studied sections provide information about the nature and direction of the transformation processes edaphic conditions under the influence of artificial restoration of forest cover on forest lands and hereditary indicates that fallows through reforestation, plantations with increasing age up to 100 years is the formation of typical forest area forest ecosystems with distinctive tiered differentiation and qualitative changes begin to appear after closing plants crowns in 24-year-old cultures.

The resulting data can be used in the process of integrated assessment particular mode habitat, environmental compliance plant communities to determine the direction of the transformation processes fallow, under the influence of pine plantations of different ages.

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