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ANALYSIS OF SILVICULTURAL-TAXATIONAL INDEX OF MODAL STANDS OF WHITE ACACIA IN TERMS PRYDNIPROVSKYI LEFT-BANK STEPPE

S.A.Sytnyk, Candidate of Biological Sciences

Dnipropetrovsk state agrarian-economic university

The analysis of silvicultural-taxational values of modal stands of Robinia pseudoacaciaL.which are located in left-bank steppe gorge was carried out. The plantation of white acacia was differentiated by types of forest growth condition, types of forest, classes of bonitet and densities. Age structure and stock of woods'determination of age population were researched.

Taxational index, types of forest, modal stands,RobiniapseudoacaciaL.

Ukraine is reasonably considered the motherland of steppe's forestation [1, 2]. History of forestation and reforestation demonstrates the permanent search of optimal types of forest cultures [7, 9]. The special attention at creation of the artificial forests in sparselywoodedsteppe districts must be given to quick-growing arboreal breeds with wide amplitude in relation to the actions of stress ecological factors. Fast-growing breeds are characterized with the substantial accumulation of phytomass forthe short intervals of time, that is important premise for realization of their ecological potential – depositing of carbon and production of oxygen [5]. The most important is consideration of fast-growing arboreal breeds incontext of bioenergetics. It is very actual for sparselywoodedareas with optimal edapho-climatic terms, but with considerableantropopressure.

Oneofsuchbreeds inPrydniprovskNorthSteppeofUkraineforestsis*Robiniapseudoacacia* L. which isanintroducentfromNorthAmerica [8].Inthewildernessthisspeciesgrowsmainlyonthewesternslopesofmountainranges, butit is intensivelyaturalizedinotherdistrictsofAmerica. The white acacia wasfirstbroughtfromVirginiatoParisin 1636byJeanRoben. The white acaciawasfirstorderedbyprofessorV.N.Kazarynin 1804 to Ukraineon the occasion ofopeningoftheKharkivuniversity, where 1804 seedlingswereplanted [6].

Nowadays *Robiniapseudoacacia* is the most spread arboreal breedin the forests of Steppe of Ukraine. In the forests of the different functional

setting, which belongs to the Dnepropetrovsk regional management of forest and hunting economy, stands of white acacia grow on an area 17683,7 ha (26,9 % from the area of total area covered by forests) [3]. A considerable role belongs to the analysis of forest management's data, which is the source of information characterizing the state of forest fund. The third of area (31478,5 ha or 34,7 %) of the Dnipropetrovsk region forests has a protection status. So, the most actual are researches, directed on the estimation of the modern state of stands of main breeds in theprotection forests.

Research aim is to carry out the analysis of silvicultural-taxational indexes ofmodal stands of*Robiniapseudoacacia* in the conditions of Tsarychans'kyy Forestry Enterprise «Dneprodzerzhinskiy forestry».

Materialsandmethodsofresearches. Forrealizationofanalysissilvicultural-taxational modal indexes ofwhite acacia were used bymaterialsofbaseforest management ofTsarychans'kyyForestry Enterpriseof «Dniprodzerzhynskforestry».

Resultsofresearches.Base materials of forest management Tsarychans'kyy Forestry Enterprise "Dneprodzerzhynsky forestry" was used for the analysis of silvicultural-taxational index stands of white acacia.Forest's category is protective, anti-erosion forests. White acacia forest with hardwood is one of the most widespread in Tsarychans'kyy forestry and occupies area of 307.5 hectares, which is 14.8 % of the forest covered with forests, which is 2080.6 ha. Except the white acacia, forest planning is formed with such species: coniferous - pine, hardwood - oak , ash green tree, ash-leaf maple. All stocks of the white acacia tree are artificial.

According to the basic material of forest Tsarychans'kyy forest district management, the white acacia forest is concentrated in nine edaphotop. Analyzing the dispatching areas on options of trophotop series, it was found out that the largest area of forest stands of acacia is presented suhrud–222.7 ha, composing 70.0 % of the area occupied by acacia plantations in the forest. Subirs occupy almost a quarter of the area of acacia plantations - 68.6 ha (21.6 %), with slight represented area, which located under the acacia tree - 26.5 ha (8.4 %) (fig. 1).

Acacia white forms stocks in terms of dry, fresh, moist and damp hyhrotops. Most of the planting area of analyzing kind is in dry conditions hyhrotop–179.9 ha (58.5 %). In the third part of the acacia is located in fresh – 96.3 (31.3 %) and moist conditions–30.3 ha (9.8 %) and very few areas only 1.0 ha (0.4 %) is in the damp conditions.

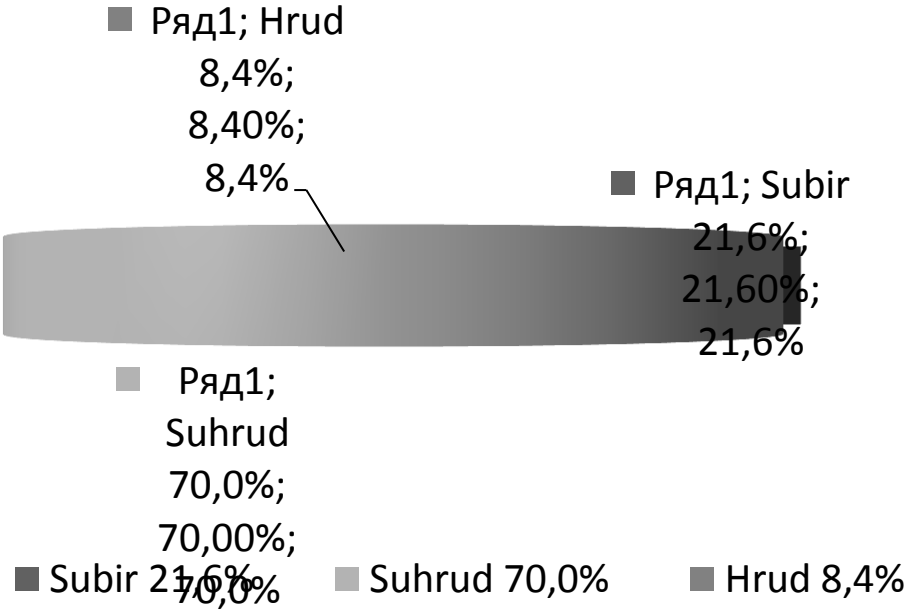

Fig. 1. Distributing of area of white acacia‘s stands are by trophotops

Analysis of the types conditions allowed to set that the white acacia stands form the type of forest in edaphotops.It is found absence of acacia in limits of edaphatop–A bir. Fifteen types of forest were detected: 46.5 % (148.2 ha) are covered with stands of white acacia, analyzed species grows in dry suhrud halogen version. In the area of 1.0 ha (0.4 %) damp black alder suhrud is presented in the smallest amount (table 1.).

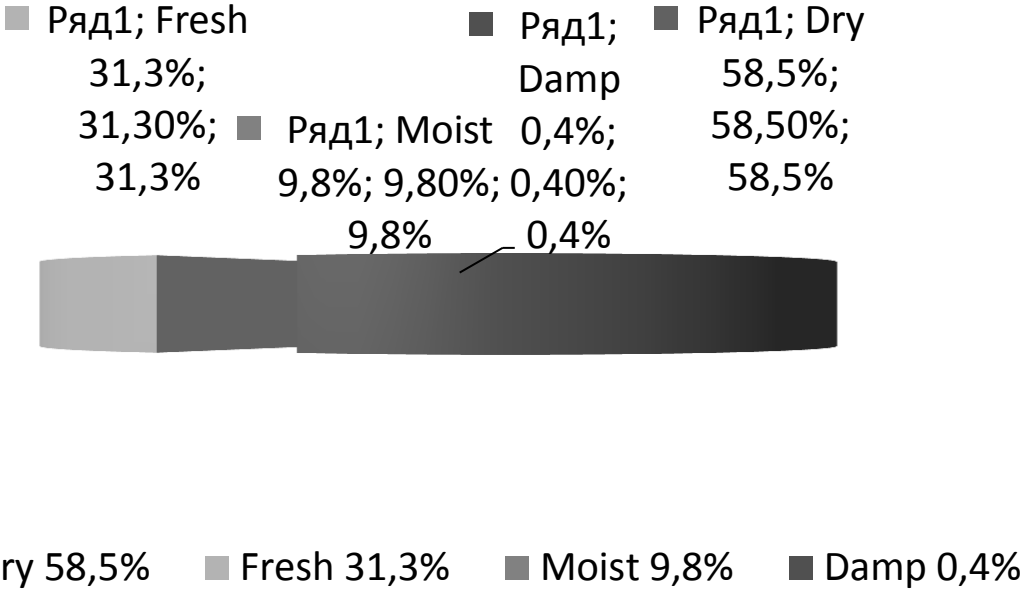

Fig. 2. Area’s distributing of the white acacia’s planting are by hygrotops

Table 1

Distributing of area of white acacia‘s stands are by types of forest

Types of forest		Area, ha
B_1H	Dry subir halogen version	12,6
B_1OP	Dry oak-pine subir	4,7
B_2FP	Fresh flood poplar subir	10,2
B_2OP	Fresh oak-pine subir	30,8
C_1H	Dry suhrud halogen version	148,2
C_1FP	Dry flood poplar suhrud	4,5
C_2S	Fresh steppe suhrud	28,2
C_2FP	Fresh flood poplar suhrud	10,7
C_2FE	Fresh flood elm suhrud	7,3
C_3FPH	Moist flood poplar suhrud halogen version	22,8
C_4BA	Damp black alder suhrud	1,0
D_1EM	Dry elm maple hrud	9,9
D_2FEM	Fresh flood elm maple hrud	5,4
D_2FP	Fresh flood poplar hrud	3,7
D_3FP	Moist flood poplar hrud	7,5
TOTAL		**307,5**

In dry conditions the predominant type of forest is dry suhrudhalogen version, which occupies an area of 148.2 ha (46.4 %). Halogen version of dry subir forests is represented on the area of 12.6 ha (4.0%) among the least area of dry forest’s types - 9.9 ha (3.1%) is presented by a dry elm maple hrud.

The biggest variety shows a fresh type in acacia plantation forest’s types: fresh oak-pine subir - 30.8 ha (9.7 %), fresh flood poplarsubir - 10.2 ha (3.2 %), fresh steppe suhrud – 28.2 ha (8.9 %), fresh flood elm suhrud - 7.3 ha (2.3 %), fresh flood elm maplehrud - 5.4 hectares (1.7 hectares), fresh flood poplar hrud – 3,7 hectares (1.2%). It necessary to remark that white acacia on the area of 183.4 ha (59.6 %) increases in halogen conditions are exposed to extreme edaphic factor - soil salinity.

The species under analysis forms pure stands (237.5 ha or 74.3 % of the area of white acacia). Fourth of area - 70.0 ha (25.7 %) is presented by mixed stands such as oak, maple, ash, black,poplars. On separate taxation’s departments by the complement of stands are: a pine, aspen.

Productivity of growing plantationare determined bybonitetof main species. According to obtained data, we think that site conditions are sufficiently favorable for the formation of highproductivity of stands of white acacia,about what testifiesby the area distribution analyzed species for the

II-nd and I-thclass of bonitet, occupying an area –146.3 ha (47.5%) and 104.0 ha (33.8 %), respectively.

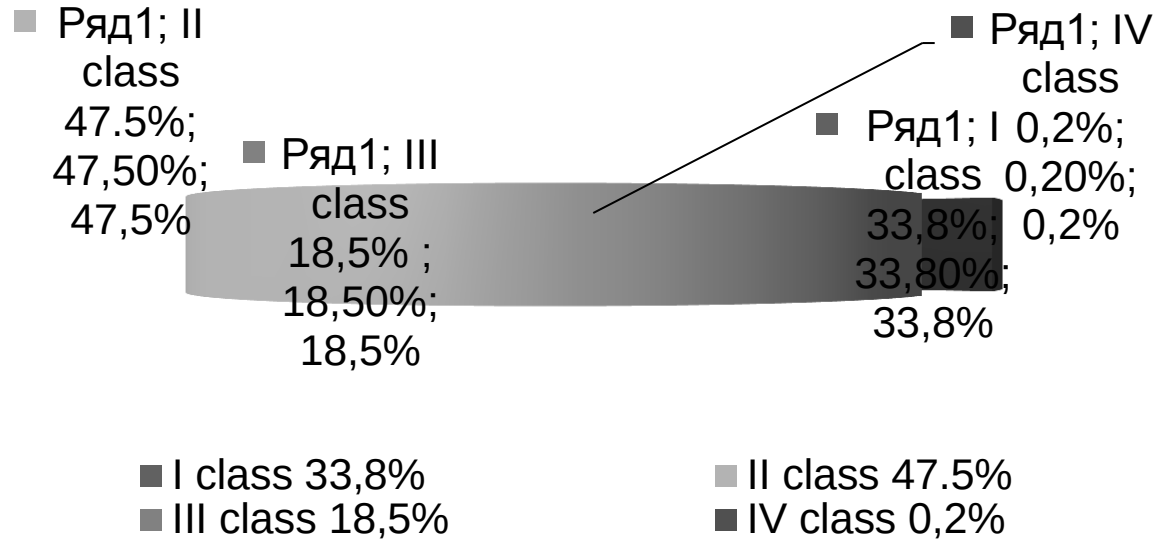

Fig 3. Area's distributing of white acacia's stands are by the bonitet's classes

The plantation of white acacia , characterized by I class of bonitet are formed mainly in dry conditions halogen version suhrud (61.4 ha or 20.0 % of the area occupied by acacia stands). Also, the acaciaof I classbonitet grow in forest types B_2FP, C_2S, C_3FPH, D_2FEM.

The acacia by II class of bonitet has greater presentation by the types of the forest. Most area of this classesstands also grow in the dry sugrudhalogen version – 53,4 ha. After other types of the forest distributing following: B_2OP – 30,8 ha; D_2FP – 10,2 ha; D_1EM – 9,9 ha; C_1FP – 1,5 ha, C_2FP – 6,4 ha, C_2FEM – 5,9 ha; C_2S – 4,8 ha; B_2FP – 3,4 ha; D_2FEM – 2,4 ha; B_1OP – 1,6 ha; C_3FPH – 0,6 ha; B_3FP – 0,4 ha.

Distributing of acacia's stands by the III class ofbonitet by the types of the forest looks like this: C_1H – 31,4 ha; B_1OP – 13,4 ha; C_3FPH – 3,6 ha; C_2FEM – 1,4 ha; D_2FEM – 1,4 ha; D_2FP – 1,0 ha; B_2FP – 0,7 ha; C_2FP – 0,7 ha.

Forest densities are dominated high densities and middle densities of white acacia stands, which cover an area of 164.6 ha (53.7 %) and 130.5 ha (42.2 %), respectively. Low densities plantations occupy 4.1 % of the area occupied by white acacia, is equal to 12.4 ha.

Basing on the thesis that the economically most profitable is the regular dispatching of planting areas by age group, as a result of the analysis of the age structure of white acacia plantation forestry permits to claim that the irregular dispatching areas occupied by age group and absence of specific age group.

Table 2

Age-dependent structure by white acacia's stands

Age group	Area		Total stock, m^3/ha	Average height, m	Average diameter$_{1.3}$, sm
	ha	%			
Young-growth stands of I class	–	–	–	–	–
Young-growth stands of II class	16,8	5,4	38,0	2,9	4,6
Middle	–	–	–	–	–
Maturing	8,8	2,9	149,0	17,0	18,0
Mature	8,0	2,6	34,4	14,6	18,0
Over mature	273,9	89,1	13010,6	16,9	20,9

The largest area is occupied by stands of over mature of acacia - 275,4 ha or 89.5 % of the total area of acacia plantation. The total stock for over mature acacia is estimated as 13010.6 m^3. Average values of taxation index over mature of acacia trees are equal: height – 16.9 m, a diameter $_{1.3}$– 20.9 sm.

Group maturing and mature in the structure trees of white acacia plantations are very low, and grow in the area 8.8 ha and 8.0 ha, respectively, but significantly different values of stock: total stock maturing trees is 149.0 m^3, mature– 43.4 m^3. The observed difference of the averagevalues of taxation index in maturing and mature trees: height - 17.0 m to 14.6 m,respectively, that is decrease in plant height at maturity onset age. The index value of the diameter of the trunk of these age groups is the same – 18.0 sm.

In the structure stands of acacia on a small area (16.8 ha or 5.4%) there is growing group of young-growth standsof II classwith total stock 38.0 m^3.

Analyzed species function in the absence of middle-age group of trees young-growth stands of I classand a limited number of young-growth standsof II class, which significantly disrupts the balance between age groups. So the age structure of the population of white acacia forest cannot be assessed as optimal.

Also, for analysis of the age structure of white acacia plantations in forest stands it was performed the separation of districts occupied by the investigated species by age class and index of productivity was calculated - the actual timber stock per unit area (hectare) on the basis of determining the degree of approximation.

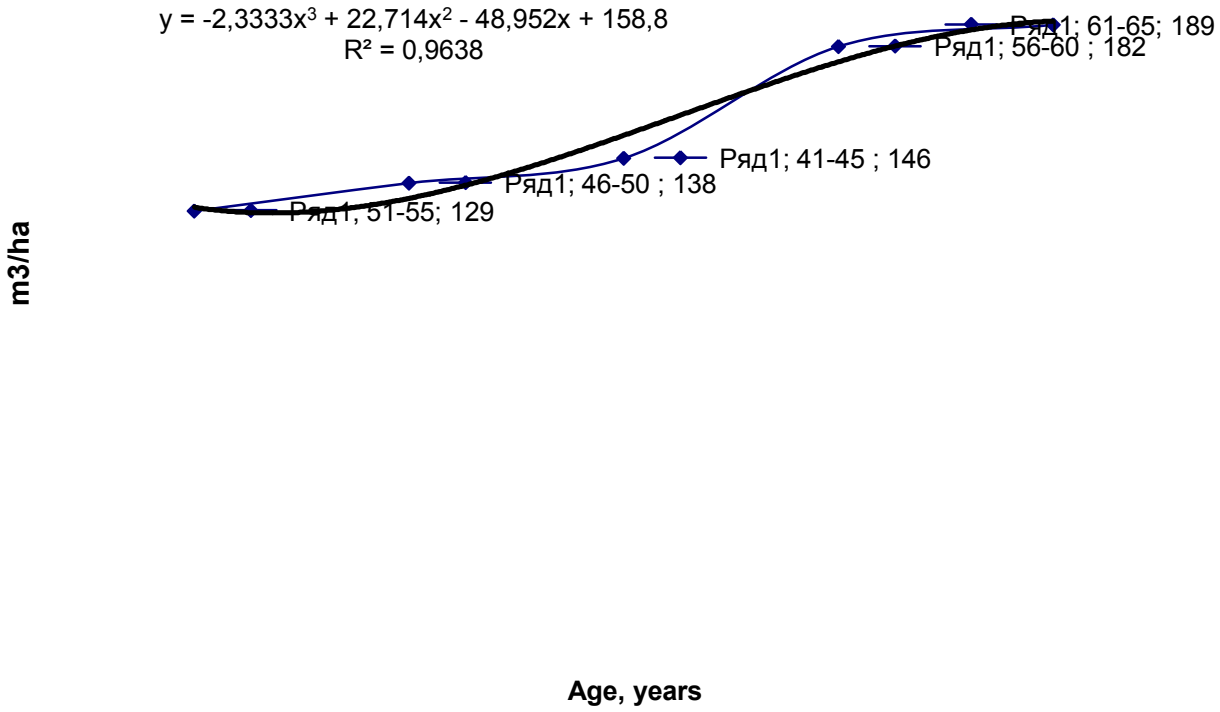

Fig. 4. **Productivity of acacia's stands depending of age**

According to that normative age for the duration of the class of white acacia is fife years, the base line data we used to calculate the baseline data for the five age classes that form stands in terms of most of the present forest type – C_1H: IXclass (41–45 years) –the average stock – 146 m³/ha ; X class (46–50 years), the average stock–138 m³/ha; XI class (51–55 years), the average stock – 129 m³/ha; XII class (56–60 years), the average stock –182 m³/ha; XIIIclass (61–65 years), the average stock – 189 m³/ha.

The white acacia at the age of 61-65 years is characterized by the largest average stock (182 m³/ha), while the smallest is (129 m³/ha) – age 51–55 years. The value of the wood stock represented on the graph shows the lack of productivity, depending on the age of the stands, polynomial dependence was not found.

Conclusions

The white acacia's stands function in edaphotops – B_{1-2}, C_{1-4}, D_{1-3}. The absence of edaphotopA – birfor given species was established. 15 types of forests were detected: 46.5 % (148.2 ha) are covered with stands of acacia, analyzed species grows in dry suhrud halogen version. in the area of 1.0 ha (0.4 %) damp black alder suhrud is presented in the smallest amount. Distributing of areas for analyzed specie by II-nd and I-th classes of bonitet testifies the favourable terms for forming of highly productive white acacia's stands. According to density, high densities and middle densities stands prevail. The trend of productivity increasing with age of

stands of acacia white is not defined. Taking in account the statutory age of the main cabin of white acacia in the forests with limited mode of usage, which is 26–30 years, it is necessary to adopt and to realize silvicultural actions regarding to modal stands of these species.

Список літератури

1. Бельгард А. Л. Степное лесоведение / А.Л. Бельгард. – М.: Лесная промышленность, 1971. – С. 336.
2. Горейко В.А. Экологическое обоснование создания лесоаграрных комплексов в степной зоне Украины / В.А. Горейко. – Д., 2000. – 315 с.
3. Гульчак В.П., Кравчук М.Ф., Дудинець А.Я., Бокало І.М. Основні положення організації і розвитку лісового господарства Дніпропетровської області. – Ірпінь, 2011. – 194 с.
4. Кривобоков В.П. Вегетативное возобновление лесных полос из акации белой на темнокаштановых почвах Украины // Лесоводство и агролесомелиорация. – К., 1980. – Вып. 57. – С. 15–19.
5. Лакида П.І. Перспективи використання біомаси лісів України для біоенергії / П.І. Лакида, Р.Д. Василишин // Лісове господарство, лісова, паперова і деревообробна промисловість: міжвід. наук.-техн. зб. – Л. НЛТУ, 2006. – Вип. 30. – С. 225–228.
6. Лапин П.И. Интродукциялесныхпород / П.И. Лапин, К.К Калуцкий., О.Н.Калуцкая. – М.: Леснаяпромышленность. – 1979. – 224 с.
7. Логгинов Б.И. Лесные культуры / Б.И. Логгинов . – К.: УСХА, 1977. – 18 с.
8. Протопопова В.В. Рослини мандрівники / В.В. Протопопова. – К.: Радянська школа, 1989. – 240 с.
9. Фурдичко О.І. Першопостаті українського лісівництва. Нариси до лісової історії / О.І. Фурдичко, В.Д. Бондаренко. – Львів: ВАТ «Бібльос», 2000. – 372 с.