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PAULOWNIA, CHARACTERISTICS AND PERSPECTIVES OF ITS EXPLOITATION

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ABSTRACT

The dynamic development of industry and technology and the increased need in the field of wood industry have led to a reduction in the forest fund. The depleted forest fund can not meet the market's needs because it takes a lot more time to reach full maturity, so there is a reason for commercial timber, which includes paulownia.

Paulownia is a wood that has exceptional growth rates and for a short period of time give a large amount of wood. Everything is used from wood. It is used as heating material, erosive protection, industrial wood, honey plant, ecological wood, decorative wood, in animal feed, pharmaceutical industry, etc. Biomass from paulownia is suitable both for silage and for alternative renewable energy sources. One of the most promising applications is bioethanol derived from cellulose. The cultivation and use of paulowane contributes to the maintenance of ecological balance and conservation of nature on our planet.

Because of the wide range of applications, the need for paulownia is constantly increasing.

Key words: paulownia, characteristics, exploitation.

INTRODUCTION

Paulownia is a deciduous tree from the Paulowniaceae family that includes a dozen species and more varieties. A very decorative and exotic decorative tree, some call it "the fastest growing in the world." The tree reaches up to 20 meters high with a wide canopy that flies gives a beautiful shade. In addition, it has a very narrow and deep root. The leaves are very large, hearty, on the upper side of the hairy, green color. The flower buds are formed already in late autumn, and it flashes in the spring, and before it spills, the tree looks beautiful, covered with large purple clusters of scented flowers. After cutting, even a low cut off from the stump intensely grows a new stem that grows much faster because its root system has already been developed. The tree can be cut at any seasons – it does not depend on the season and deadlines for harvesting.

It originates from China, but it is cultivated for a long time in Japan and Korea.

The original, original name of the genus is Pavlovnia, but was later changed to Paulownia. It is named after Queen Anne Pavlovna, the daughter of Emperor Pavle I Petrović. This tree is also known as "princess tree" for the same reason. In China, the oak tree is called "dragon tree" and in Japan – "kiri".

The use of paulowne in Japan dates back to 200 g. p.n.e. In parts of China, there is a tradition when a little girl is born to plant a peacock paul for happiness, but also for a dowry, and the tree cuts on the wedding day and is used for making furniture. In addition, it was believed that if the peacock was planted near the house, the bird of the phoenix would come and bring happiness.

During the 19th century paulownia was also transmitted to the US territory. Seafood

seeds were used for packaging when transporting expensive porcelain plates across the Pacific Ocean. After unpacking small seeds, the wind was adapted to the climatic conditions of the eastern US states.

Since the 70s of the 20th century, Japan has been unable to produce pauly to meet the increased demand. There is highly appreciated the outward appearance of wood material and in most households in Japan there is at least one thing or part of the furniture made of paulow.

During the 1990s, plantations for the cultivation of paulownia were created primarily in the countries of Central and South-East America. Now these plantations are ready to produce high quality light wood material. Rapidly growing paulownia is an available alternative to the increasingly diverse wild diversity that is encountered in natural conditions.

In the history of China, China is the largest producer of paulownia. The largest exporters are Australia, Japan and China along with the United States, and Japan is the largest buyer of popcorn trees.

At present, plantations of paulownia are in almost all of Europe.

Figure 1: Plantations of paulownia in Serbia, surroundings of Vranje

SUBJECT AND OBJECTIVE OF WORK

This paper is based on a review of key characteristics and the application of the species of the genus Paulownia.

It also points to the significance of growing paulownia as a fast growing species for the purpose of economic viability, the preservation of natural resources and the maintenance of ecological balance.

MATERIAL AND METHOD OF WORK

In the paper, theoretical analysis was accompanied by the experiences and results of the research from the domestic and international literature, that is, the knowledge of the authors who dealt with the issues involved in this work. Scientific and theoretical knowledge, relevant literature and modern business practice were investigated.

RESULTS AND DISCUSSION

All kinds of peacocks are fast growing trees. Table 1 shows a comparison of the growth rates of the first seven species of rapidly growing trees on our planet.

Table 1: Characteristics of the comparisons by the growth rate of the first seven species of rapidly growing trees on our planet

Species	Yearly increase	Height of a three year old tree	Maximum height of ripe wood
Paulownia (Paulownia spp.)	**3 – 6 m**	**10,5 – 17,5 m**	**15 – 25 m**
Hybrid willow (Salix spp. hybrid)	**1,5 -4 m**	**7,5 -12 m**	**15 – 25 m**
Black poplar (Populus nigra)	**2,5 -3,5 m**	**9 – 12 m**	**20 -25 m**
Hybrid poplar (Populus deltoides)	**2,5 -3,5 m**	**9 – 12 m**	**20 -30 m**
Texas red oak (Quercus texana)	**2 – 2,5 m**	**7,5 – 9 m**	**15 – 20 m**
Red eucalyptus (Eucalyptus polyanthemos)	**2 – 2,5 m**	**6 – 9 m**	**10 – 15 m**
Weeping willow (Salix babylonica)	**1,5 – 2,5 m**	**4,5 – 9 m**	**15 – 20 m**

** Data obtained through research on the territory of the United States and Europe*

The table shows that the species Paulownia (Paulownia spp.) Have the fastest growth, incomparable with any other species. Namely, in six to seven years this tree grows up to 20 meters. Wood material can be obtained for a period of 8 – 15 years. Because of these characteristics of some kind of paulownia such as Paulownia tomentosa, Paulownia elongata, Paulownia fortunei and others. they have a wide range of applications because the peacock is a tree from which the entire product of the plant is used, it does not pollute the environment and does not change it, and therefore paucus is considered to be the tree of the future.

APPLICATION OF PAULOWNIE

Paulownia has application in many areas of economy and agriculture. She is not just an exotic tree. Wood mass, leaves, flowers – they all have more than useful properties. Here we will list all the important aspects of the use of pauloway.

The use of paul is quite broad. It is used as heating material, erosive protection, industrial wood, honey plant, ecological wood, decorative wood, in animal feed, pharmaceutical industry, etc.

Application of paulle for industrial purposes

One of the characteristics of the tree from the peacock is that it is very easy. This is the reason why it is often used in the construction of details where lightness is of great importance, and precisely for airplanes and craft parts. It is also highly appreciated as a material for the production of cassettes, pallets, finished products for transport, because it thus saves on the overall weight of the total goods for transport; This leads to lower fuel costs, the ability to transport more goods, and consequently leads to a lower transportation cost, which is the goal of anyone involved in

logistics. Lately, this type of wood is pleasingly used for interior solutions in car manufacturing. The corresponding combination of quality is appropriate, and it is easy to just one of them.

The following quality is low moisture content and low fire hazard in wood material from Paulus. It has 10-12% moisture, it is difficult to absorb water and therefore the details made from it do not deform as it is observed in most of the wood parts exposed to moisture. The reason for this is its fibrous structure due to specific cells. That's exactly what distinguishes it from the selection of wood for the production of sauna and furniture.

Figure 2: Timber treated paulovnie

Paulownia is more important in making not only the saunas bench but also various competition boats, all combined with ease of production and low cost. Use of paulownia in sports is of great importance, surf boards, snowboards and skis are made.

It is especially necessary to point out that the wooden material from the peacock is extremely resistant to the drones of all kinds. This fact is very priced in countries where it is a practice to live in houses of wood. Unlike the fast-growing species of the genus Quercus, which is tanninous concentrate in leaves, the genus of the paulowe suffers tannins (polyphenols or tanning substances that have a backyard taste), have the effect of bacteria and mushrooms in the tree that makes them resistant to the invasion of wood and thymic.

The quality list of this tree is the smoothness and lack of knots. The interesting feature of the beam from the peacock is that they retain the screws at the ends without breaking into it.

It is often used paulownia in the production of parquet, but in this case, as well as in the production of certain parts of the furniture, the wood is veneered with some hardwood, for example, walnut. Also, due to its high moisture resistance, the furniture produced from the paulow is resistant to deformation.

The peacock wood can be used for the production of musical instruments. The material is distinguished by the specific acoustic properties that Asian musical instrument makers have known for a long time, but the development is still in the field.

Also, paulow wood is used to make toys paper and other.

Due to its low content of the resin, wooden material from the peacock has a low degree of fire hazard, because it is difficult to encourage it to plan. In addition to the aforementioned, the essential feature of the woods paulownia in the manufacture of furniture is the resistance to the attacks of the wood carvers. Due to its softness, wood from the peacock can also be adorned with the most complex carvings.

There is a motivation to constantly seek new purposes of using wood from the peacock, which makes a significant difference between the cost of production and the expected, realized revenues.

Paulownia as a tree for the material

Paulowy is first cultivated for the production of timber. Wood is 30% lighter than any other wood for material. The colors are honey, they quickly dry on the external temperature, they are afraid of it. In the industry it is also known as "wood of aluminum" due to its strength and bending and twisting resistance.

Figure 3: Elements obtained by wood processing paulovnie

Application of paulownia for energy purpose

The use of paulownia as a firewood derives from its high-calorific value. Namely, the wood is excellent for heating because it has a calorific value of 4500 kilocalories, which is the same as the calorific value of good coal, giving only 0.57 kilograms per ton of ash. Due to these characteristics it is used for the production of briquettes and pellets production. Pellets obtained from this wood is very much sought after in the international market.

Figure 4: Pellets of paulownia

If you plant a hectare plant he can be planted in a 2x2 or 2x1.5 meter thickness, and every 5 years he gets more than one meter of wood for heating one plant. So, a thousand plants per hectare – and each one gets a meter of wood – the calculation is simple Paulownia as a raw material for biomass

Paulownia is one of the fastest growing species on the planet (1 plant – 1m^3 of wood for a period of 7 years). At the time when, before introducing anything new to production or agriculture, we should think if it will not harm nature, in an era when society finally begins to measure its technological progress with the degree of conservation of nature, paulownia is a small fortune.

Rapid tree growth is exclusively beneficial for generating large amounts of biomass in a short time. A lot of manufacturers are already introducing this practice on their farms. Densely planted peacocks in the short term achieve the necessary development without taking up a lot of arable land. Biomass from paulownia is appropriate for both silage (for livestock feed) and for many other purposes, including as raw material for alternative renewable energy sources. One of the most promising bioethanol is cellulose. There are two methods for obtaining bioethanol – one with cultivated for that purpose microorganisms that use cellulose as a source of energy and which give ethanol as a product of the exchange process; the other is based on the action of certain enzymes that break down cellulose to the desired product. Regardless of the fact that the first is cheaper and more used, both have the advantages and the future. Apart from the many areas where bioethanol is used, some scientists consider it a fuel for the future – easy to manufacture and use without risk to the environment. As we have already mentioned, biomass from paulownia is the appropriate raw material for the production of bioethanol, but not the only

one. In the processing of paulowing and obtaining wood material from it, branches and other parts that formally referred to as waste are normally left, but not only they are not dumped, but also another source of cellulose for the production of bioethanol.

Use of lean mass for animal feed

Leafy soybean meal is appropriate for its composition for the preparation of additional food to travopasnim animals. It contains about 20% protein and a large number of different microelements and its quality is similar to clover.

For the production of fodder, it is planted in 4000 plants per hectare that grow when they grow 80–90 centimeters and give 6 to 7 rotts per year.

Easy access to leaves and high yields provide low cost, which is one of the most important indicators in selecting food in industrial cattle breeding.

Picture 5: Paulownia (Breeder and author of photography Z. Janjić, Srpska Kuća)

Application of paulownia in the pharmaceutical industry

It has been found that the leaves contain substances that favorably affect the work of the liver, kidneys and bile, and it also works in lung diseases.

In China, these properties have long been known and the pharmaceutical industry is engaged in the production of medicines based on paulownia.

The leaves have other properties – their use in cosmetics in Asian countries is as old as their use in medicine. In the last few years, leaves of the leaves of pauliflower are included in the composition of cream and per-

fume. The same applies to flowers as the paucous flower aroma defines as "vanilla, powder aroma and little almonds". It has been found to be due to the heliotropin contained in the flowers – a substance known in the perfumery that is found in other aromas (Tahitian vanilla).

Honey-like properties of paulownia

Paul's abundant flower. In addition to the beauty of the flower of the paulche, it stands out with a pleasant scent. Its significance as honeycombs, in addition to quality honey, lies in the fact that the bee should not visit many flowers to collect nectar because the flowers are extremely rich in nectar. From one hectare of bees, they can collect between 900 and 1000 kilograms of nectar. Honey from the peacock is high quality, aromatic, light and very light and can be compared with acacia honey. Apart from delicacies, honey also has healing properties, it can help in the treatment of bronchitis and other respiratory diseases, and also improves the activity of the liver, liver and digestion.

In China, almost all of which can be purchased is obtained from the peacock. Atlantic oysters are constantly expanding in that country, but currently stretching over 22,000 km².

Apart from quality honey, the flowers are pauloway thanks to the biologically active substances that are used in them as food.

From the seed, oil is used which is used in the production of medicines (Bađun, S., 1983).

Application of paulownia for decorative purposes

Because of the beautiful flowers that adorn the wide crown of this tree, they have long been included in almost obligatory forest species in gardens and parks – not only in Asia, but also in the United States and Europe. It is very resistant to urban pollution and disease. With huge leaves and a rich crown, and without waiting for growth for years, it provides a thick shadow at rest areas, so parks with a peacock represent pleasant cool corners amid the heat and dust of large cities. The KJOTO Environmental Protection Program places the orange on the first place among plants, such as ores and air purifiers. Due to its constitution and leaf mass of paulow, by releasing 1 gram of carbon dioxide CO_2, it releases 0.75 grams of oxygen O_2. In the forest of the ocean, the amount of light ionic oxygen is estimated to be 2,500 in cm^3, while in a closed room, which does not spend only 100 light ionic oxygen in cm^3.

Paulownia for the purpose of afforestation

Enormous flowering and leaf size help with successful afforestation and recovery of polluted forests. After a serious weight of leaves, after October, it provides fast natural fertilization of depleted surfaces.

Due to the fragmented tree root system, it is also used against land erosion. It has long been a routine practice in some countries – for example in the United States, where erosion is a constant problem.

There is a motivation to constantly seek new purposes of using wood from the peacock, which makes a significant difference between the cost of production and the expected, realized revenues.

CONCLUSION

On the basis of everything exposed, the fact is that Paulownia species are characterized by extremely rapid growth and for a short period of time they give a large amount of wood, which they recommend for growing in forest plantations in Serbia. The prospects of more intensive cultivation of paulownia and its exploitation on the territory of Serbia and the Balkans can be made on the basis of

more detailed research of existing forest plantations in different habitats of Serbia.

The species of paulownia with an increment of 1 m^3 in 7–8 years is one of the fastest growing species on the planet. Fast tree growth is exclusively beneficial for generating large amounts of biomass in a short time. We use everything from the tree. Biomass from paulownia is suitable both for silage and for many other purposes, including as raw material for alternative renewable energy sources. One of the most promising features is bioethanol derived from cellulose. Wood pulp also produces pellets that are used as heating materials whose use is constantly growing.

The cultivation and processing of paulowne involves not only the circle of the exchange of matter in nature, but also actively contributes to maintaining the ecological balance and conservation of nature.

The general conclusion is that paulownia has a very good perspective in the future.

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