Pathological Condition of Introduced Broadleaves in the Forests of South-Western and Western Lithuania

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Abstract

In six forest enterprises and twelve forest districts of south-western and western Lithuania the condition of introduced trees of *Acer*, *Juglans, Fagus*, *Quercus*, *Phellodendron, Populus, Robinia* genera was studied in 2003-2005. The condition of all studied broadleaved trees was sufficiently good to grow them in Lithuanian forests along with native tree species for the enrichment of biological diversity and forest soil improvement. In the places of industrial and traffic pollution, the trees of *Acer* genus, *Robinia pseudoacacia* may be used. Quite perspective species for wood production in this part of Lithuania could be *Juglans cinerea, Fagus sylvatica*, *Quercus robur.* Acclimatization success of some studied species, such as *Acer negundo, Populus genus,* is limited by biotic (diseases and pests) factors. All the introducents are considered to be naturalized in Lithuania.

Key words: introduction, broadleaves, diseases, pests, condition

Introduction

Woody plants are introduced to enrich the diversity of dendroflora in cases these species are significantly more productive than native ones. In landscape gardens – especially ornamental species and forms of trees are planted. Introduction is based on selection methods. Firstly, the most valuable progenies of native range growing in different ecological conditions are selected. Their offsprings are transfered to experimental plantations, by selecting the most valuable genotypes and families. Plantations of introduced tree species provide a very good basis for further selection (*e.g.* hybridization) activities.

Growing of introduced trees and unrelated problems in Lithuania are tackted from the 19th century (Ramanauskas 1973, Navasaitis 2004). 200-150 years ago introducents became the most important components of estates. Later they predominated in towns and settlements, quite frequently occurring in farmsteads, on road-sides and even in the fields. In all the cases positive characteristics of introducents are revealed fairly well: exotic appearance and decorativeness, specific resistance to adverse edaphic and other conditions in urban areas. It is characteristic of them in case of a properly selected assortment. Moreover, both in the course of organized and spontaneous introduction the diversity of introducents from different regions of the world is increasing ever more.

A fairly important aspect is higher or complete resistance of some introduced plants to pests and diseases, as compared to native plants (Рупайс 1961, Рупайс 1989).

Landscape and park specialists are satisfied with this characteristics of introducents, however foresters, seeking to grow productive and resistant stands producing high-quality timber, are more cautions. In this case a very important factor is the relationship of introducents, growing in forests, with harmful organisms. The agents of pests and diseases may rather effectively limit the spreading of not a single introduced species providing economically valuable timber (Butin 1983).

The perspectiveness of introduction is judged by species evolution, biological and economical value of its trees under natural growth conditions, the range of species adaptivity and by genetic diversity which is proportional to the size of native range and geographical latitude (Schwerdtfeger 1981). Introduced trees are evaluated by the method of ecxperimental

plantations established on different sites and in natural reg ions.

Broadleaved species *Fagus sylvatica* and *Quercus rubra* were started to grow in Lithuanian forests in the 19th century.

Aim of the work was to study sanitary condition of introduced broadleaved trees in Lithuanian forests, their most important damagers, to ascertain their main pests and diseases and bioecology.

Materials and methods

The condition of introduced broadleaves was assessed in the stands of south-western and central Lithuania: in Alytus Forest Enterprise (Alytus forest district), Jonava Forest Enterprise (Jonava forest district), Prienai Forest Enterprise (Birštonas forest district), Šilutė Forest Enterprise (Norkaičiai forest district), Dubrava Experimental – Training Forest Enterprise (Vaišvydava forest district).

The trees were described according to M. Navasaitis (2004), and the taxonomy of growing plants in Lithuania, which had been compiled by Z. Gudžinskas, was used (Gudžinskas 1999).

The degree of tree damage was estimated according to the methods used by S. V. Ševčenko (1978), R. Ozolinčius (1998), A. Juodvalkis and A. Vasiliauskas (2002), and adopted in our work methodics. The categories of tree condition were estimated within 5-grade scale (Table 1).

Table 1. Scale of tree damage assessment

Degree of damage	Characteristics	Grades
Relatively healthy	No signs of damage, crown characteristic of the species, defoliation up to 10 %, trees without signs of weakening	1
Weakened	Trees with slightly open crown – insignificant defoliation (11-25 %); reduced increment, up to 1/3 of the foliage is damaged. Individual branches are dead. The bark of stems and branches contains small dead patches	2
Weak	Open crown – average defoliation (26-60 %). Highly reduced increment or its absence. Up to 2/3 of the foliage and branches are damaged or dead. Dead tops of the trees. The stem contains big damaged areas	3
Dying	Crown is extremely open – significant defoliation (60-99 %); light green, turning yellow leaves. 2/3 of the foliage is damaged. Dry tops of trees. There are signs of stem pest infestation	4
Fresh deadwood	Recently dead trees. The foliage is dead and remains on trees or has dropped. Bark beetles have left or stay in the wood	5

For each tree species average damage grade has been estimated, having modified methodics applied in agriculture and forestry (Juodvalkis and Vasiliauskas 2002, Šurkus and Gauriličkienė 2002) according to the formula:

$V = \Sigma(n \cdot b) / N$, where

V – average damage grade,

$\Sigma(n \cdot b)$ – number of plants damaged to the same grade and the sum of products of the grade,

N – number of checked plants.

Pathogenes were identified according to the symptoms of diseases, cultural and morphological features of identified microorganisms based on descriptors (Pileckis *et al.* 1968, Butin 1983, Черемисинов *et al.* 1970, Minkevičius and Ignatavičiūtė 1991, Ignatavičiūtė and Treigienė 1998, Hartman *et al.* 2005). The pests were described according to (Lampel 1968, Heie 1980, Rupeis 1989, Remaudier, G. and Remaudier, M. 1997, Hartman *et al.* 2005).

Results

The condition of woody introducents in Lithuanian forests has not been sufficiently studied until now. Only introduced trees growing in parks and city plantations were discribed, as well as their condition has been evaluated (Budriūnas *et al.* 2000, Juronis and Sneškienė 2002, Januškevičius 2004 *et al.*), while in the forest only native species have been studied in detail (Ozolinčius 1998, Navasaitis *et al.* 2003).

The southwestern and central parts of Lithuania have been chosen for the studies as the region of a more favourable climate for introduced species. The condition of seven genera of introduced species was assessed: *Acer, Fagus, Juglans, Phellodendron, Populus, Quercus* ir *Robinia*.

Condition of the *Acer* genus plants

Acer negundo L. – ashleaved maple

Several decades ago the species was abundantly planted in city streets, however, it turned out that they are unsuitable for the purpose due to their bad physiological and phytopathological condition. The condition of trees of the species growing in forests is better (Table 2). Since as its wood is not valuable the species is not perspective in forestry.

Table 2. Sanitary condition of ashleaved maple

Habitat	Number of observed trees	Year	Grade of damage 1	2	3	4	5	Average grade of damage
Jonava forest district	100	2003	30	58	12	0	0	1.82±0.04
		2004	25	60	15	0	0	1.9±0.04
		2005	26	61	13	0	0	1.87±0.04
Vaišvydava forest district	30	2003	15	12	3	0	0	1.6±0.15
		2004	14	12	4	0	0	1.67±0.15
		2005	15	11	4	0	0	1.63±0.15

Every year young shoots are damaged by powdery mildew (agent *Uncinula bicornis* (Wallr.: Fr.) Lev.). The increment of trees growing in the forest is low, therefore, the portion of damaged plant is insignificant (up to 2 grades). More damage is caused by *Diplodina acerina* (Pass.) B. Sutton, desiccating young twigs. Nearly all trees are damaged by this fungus, and the degree of damage increases with ageing (3 grades 12-15 %).

***Acer pseudoplatanus* L. – sycamore maple**

In the study areas the condition of sycamore maple was sufficiently good (Table 3).

Table 3. Sanitary condition of sycamore maple

Habitat	Number of observed trees	Year	Grade of damage					Average grade of damage
			1	2	3	4	5	
Birštonas forest district	30	2003	26	4	0	0	0	1.33±0.18
		2004	25	5	0	0	0	1.67±0.18
		2005	25	5	0	0	0	1.67±0.18
Jonava forest district	50	2003	20	27	3	0	0	1.66±0.09
		2004	20	26	4	0	0	1.68±0.09
		2005	20	26	4	0	0	1.68±0.09
Norkaičiai forest district	50	2003	26	22	2	0	0	1.7±0.09
		2004	26	21	3	0	0	1.72±0.09
		2005	27	20	3	0	0	1.72±0.09

Disease agents on this species of maples were by far less found than on other forest maples. A very small part of the observed plants (about 2 %) was damaged by *Uncinula bicornis*. The intensity of damage was low as well – up to 2 grades.

The condition of European beech (*Fagus sylvatica* L.)

Beech was observed in two stands of Norkaičiai forest district. Weymouth pine (*Pinus strobes* L.) stand was established 130 years ago and after some time beech was planted under the pines. The condition of most of the 100-year-old trees is good (Table 4).

Table 4. Sanitary condition of European beech

Habitat	Number of observed trees	Year	Grade of damage					Average grade of damage
			1	2	3	4	5	
Norkaičiai forest district (with Weymouth pine)	50	2003	30	15	5	0	0	1.5±0.09
		2004	30	16	4	0	0	1.48±0.09
		2005	30	16	4	0	0	1.48±0.09
Norkaičiai forest district (with pedunculate oak)	50	2003	39	16	5	0	0	1.52±0.09
		2004	30	15	5	0	0	1.5±0.09
		2005	30	15	5	0	0	1.5±0.09

Beeches of good condition and of the same age grow in another stand along with pedunculate oak (*Qercus robur* L.). No agents of diseases were observed.

The most frequently detected pest is beech blight (*Phyllaphis fagi* L.). Heavily damaged trees loose a lot of assimilates, their increment noticeably decreases, and the plants stunt. This is a potentially dangerous pest for young beeches in nurseries. It heavily damages beeches in the plantations of cities and towns, where it is undoubtedly harmful. However, in the forests of western Lithuania it failed to cause any noticeable damage up to now.

Both stands contain many self-sown beeches of different ages. As far as the eastern boundary of the natural range of European beech approaches the Kaliningrad region (Navasaitis and Navasaitis 1979), climatic conditions in the western part of Lithuania are very similar and favourable to trees of the species.

The condition of butternut (*Juglans cinerea* L.)

Butternuts observed in two forest districts were of good condition (Table 5).

Table 5. Sanitary condition of butternut

Habitat	Number of observed trees	Year	Grade of damage					Average grade of damage
			1	2	3	4	5	
Birštonas forest district	20	2003	20	0	0	0	0	1.1±0.27
		2004	20	0	0	0	0	1.1±0.27
		2005	20	0	0	0	0	1.15±0.27
Vaišvydava forest district	40	2003	40	0	0	0	0	1.03±0.14
		2004	40	0	0	0	0	1.03±0.14
		2005	40	0	0	0	0	1.05±0.14

Around planted trees there grow many self-regenerated seedlings.

The condition of cork tree (*Phellodendron amurense* Rupr.)

Trees of this species were detected and their condition was assessed only in one growth site– Vaišvydava forest district (Table 6).

Table 6. Sanitary condition of cork tree

Habitat	Number of trees	Year	Grade of damage					Average grade of damage
			1	2	3	4	5	
Vaišvydava forest district	30	2003	15	13	2	0	0	1.57±0.015
		2004	14	14	2	0	0	1.6±0.15
		2005	14	13	3	0	0	1.63±0.15

Perhaps owing to the fact that conditions in this place (a rather moist valley) are similar to the natural ones (Ramanauskas 1973, Navasaitis and Navasaitis 1979), the condition of trees was good. However, the suitability of the species for Lithuanian forests cannot be judged by one example, moreover according to literature sources it was attempted to grow cork tree

in our forests 40 years ago, but everywhere they were suppressed by local species and disappeared (Navasaitis 2004).

Condition of the *Populus* genus trees

In Vaišvydava plantations different hybrids of aspen grow: *Populus tremuloides* × *P. tremula. P. tremula* × *P. tremula. P. tremula* × *P. alba*. The plantations were established in 1984. Already at the age of 21 damages by rot were observed on almost all (90%) studied trees (Table 7). The stems of trees contained mechanical damages (bark stripping), scars, which promoted rot infection.

The sanitary condition of hybrid aspen plantations to a large extent may be preconditioned both by the genetic properties and ecological conditions. Thus it is necessary to consider them in assessing stem rot-resistance of *Populus tremuloides* × *P. tremula*. Such contrasting data were obtained studying plantations of good sanitary condition of the hybrids in the Girionys park. These plantations are almost mature (37 yr.), *i.e*. nearly twice older than the analysed experimental plantations (Vaišvydava forest district) of hybrid aspen, heavily damaged by rot. In the Girionys park the plantations of hybrid aspen were established under optimal growth conditions on the slope of a stream bank with sufficiently fertile soil and proper moisture regime. The stems of trees were not scars damaged by animals. For these reasons rot soread siower (Table 7). A better sanitary condition of plantations might have been preconditioned by better genetic traits of the hybrids (parent pairs). R.Murkaite's (1978) publications contain data on the used in cross-breeding two *P.tremuloides* genotypes of high selectional value, which have been used in cross-breeding.

Table 7. Sanitary condition of *Populus* genus trees

Habitat	Species or hybrids	Number of trees	Year	Grade of damage					
				1	2	3	4	5	Average grade of damage
Vaišvydava forest district	Different aspen hybrids	50	2005	12	20	13	5	0	2.8 ± 0.03
The Girionys park	*P.tremuloides* x *P.tremula*	18	2005	14	4	0	0	0	1.1 ± 0.03
Samylai administrative district	*P.alba*	18	2005	16	1	1	0	0	1.1 ± 0.02

Out of all studied *Leuce* sub-genus poplars and their hybrids, trees selected in the white poplar grove (*Populus alba*) were distinguished by healthy stems. The grove of white poplar in Samylai administrative district were established on the former farmland on an averagely fertile site. The trees of white poplar at the age of 80 years attained impressive dimensions (height from 26 to 34 m. diameter – from 57 to 76 cm). At this age rot-infection is easily assessed: either rot agents are observed on trees or the trees are considered to be healthy. Rot agents were not observed on poplars in the white polar grove (Table 7). Only one tree contained an uncertain rudiment of rot as a dark spot of 2 cm in diameter in the place of branch. One tree contained a rotwood rot which spread up to 1.5 m of the stem with developed mycothallus of *Ganoderma applanatum.*

Apart from earlier mentioned pests. trees of the *Populus* genus are damaged also by *Lithocolletis populifoliela* Tr. It is widespread in Western and Eastern Europe. Siberia, in the Middle East. It damages poplars of different species: *Populus balsamifera. P. nigra. P. canadensis. P. laurifolia. P. tremula.* It was not found on *P. canescens* and is seldom detected on *P. simonii* (Гречкин, Воронцов 1962). The greatest damage is caused to the plantations of cities and towns, where conditions for the overwintering of moths are safer and more favourable.

The condition of American oak (*Quercus rubra* L.)

Most local pathogens have not adapted to parasitize American oak which was started to be grow in Lithuanian forests since 1890-1895. From the phytopathological point of view this species is more resistant to diseases than the local pedunculate oak. In Lithuania disease agents have been detected on pedunculate oak several time more than on American oak (Treigienė 1997). Climatic conditions for American oaks are not quite suitable in Lithuania: they suffer from temperature fluctuations which in Lithuania are frequent at the end of winter and at the beginning of spring. In the daytime the sun heats the stems (especially in the south and south-west sides), while at night. when temperature falls down. the stems fissure. The wounds are colonized then by wood-destroying fungi. Most (about 80 %) of American oaks with damaged bark contained the mycothallus of *Schizophyllum commune* Fr. For a long time foresters considered this fungus to be a saprotroph destroying dead wood (Rypacek 1957, Pileckis *et al*. 1968, Черемисинов *et al*. 1970). However, our observations (earlier ones with other tree species) (Snieškienė and Juronis 1999, Snieškienė and Juronis 2001, Juronis and Snieškienė 2001) as well as the data obtained by some other authors (Raškauskas 1962) show that this fungus may also parasitize under favourable conditions and when a tree is weakened. *Schizophyllum commune*. being unharmful to undamaged trees, but having occurred on the wound, damages bark and the outer wood layers, inhibits healing of wounds and provides favourable conditions for the infestation of true pathogens, *i.e*. wood-destroying fungi. In the habitats with more obvious features of continental climate (Alytus forest district), the reasons for worse condition of oaks were

climatic conditions and damages by *Schizophyllum commune* (Table 8).

Table 8. Sanitary condition of American oak

Habitat	Number of trees	Year	Grade of damage					Average grade of damage
			1	2	3	4	5	
Alytus forest district	122	2003	45	53	22	2	0	1.84±0.03
	124	2004	44	54	23	3	0	1.88±0.03
	124	2005	40	52	26	5	1	1.98±0.03
Birštonas forest district	30	2003	25	5	0	0	0	1.17±0.18
		2004	24	6	0	0	0	1.2±0.17
		2005	24	6	0	0	0	1.2±0.17
Jonava forest district	100	2003	70	16	12	2	0	1.08±0.05
		2004	70	14	14	2	0	1.1±0.05
		2005	68	16	13	2	1	1.1±0.05
Nursery of Jonava forest district	100				16			1.38±0.05
		2003	78	6	16	0	0	1.39±0.05
		2004	77	7	16	0	0	1.39±0.05
		2005	77	7		0	0	
Kintai forest district	50	2003	20	18	10	2	0	1.84±0.08
		2004	20	19	9	2	0	1.82±0.08
		2005	20	17	11	2	0	1.86±0.08
Norkaičiai forest district	50	2003	20	24	6	0	0	1.72±0.09
		2004	20	24	6	0	0	1.72±0.09
		2005	20	23	7	1	0	1.74±0.09

Habitats closer to the sea (Kintai. Norkaičiai forest districts) contained less number of oaks damaged in this way. The character of damages on plants of different ages differs. In Alytus nursery young oaks were slightly (up to 2 grades on 3 % of plants) damaged by powdery mildew (agent *Microsphaera alphitoides* Griffon & Maubl.) and non-infectious leaf necrosis. In all study areas poldery mildew was not observed on older plants – American oak is more resistant to this disease than pedunculate oak.

From selection viewpoint, apart from the good traits of American oak, some negative traits characteristic of the species were revealed: more biforkated. crooked trees with stem regrowths, more wolf shoots than on pedunculate oak. An intensive selection could reduce manifestation of these negative traits.

The condition of black locust (*Robinia pseudoacacia* L.)

In all habitats, where black locust was observed, their condition was good (average grade of damage 1.08-1.25) (Table 9).

Table 9. Sanitary condition of black locust

Habitat	Number of trees	Year	Grade of damage					Average grade of damage
			1	2	3	4	5	
Jonava forest district	40	2003	30	10	0	0	0	1.25±0.13
		2004	31	9	0	0	0	1.23±0.13
		2005	30	10	0	0	0	1.25±0.13
Vaišvydava forest district	50	2003	45	5	0	0	0	1.1±0.10
		2004	45	5	0	0	0	1.08±0.10
		2005	45	5	0	0	0	1.1±0.10

The agents of leaf diseases *Erysiphe polygoni* DC and *Phloeospora robiniae* (Lib.) Holn. frequent on black locust in the plantations of cities and towns were not observed in the forest. In Jonava forest district black locust together with other introduced trees (ash-leaved and sycamore maples. American oak. poplars) were established to substitute pine stands which had died due to air pollution (Navasaitis 2004). Here the condition of all the trees is sufficiently good.

Discussion

The diversity of pests and diseases of trees-introducents. their abundance and distribution as well as harmfulness differs in different stands and depends on many factors. Their harmfulness to a large extent depends on how well ecological requirements of the species coincide with habitat conditions.

Part of the harmful agents are of imported origin as the plants themselves (Table 10).

Table 10. Specific alien pests found in the stands of introduced broadleaves in Lithuania

No	Plant-host	Pest
2.	*Acer pseudoplatanus*	*Aceria pseudoplatani* Corti *A. cephaloneus* Nal. *Drepanosiphum platanoidis* Schrk.
3.	*Fagus sylvatica*	*Eriophyes plicans* Nal. *E. stenaspis* Nal. *Phyllaphis fagi* L. *Lithocolletis faginella* Z.

Very often they concentrate in local infestation places, therefore. the character of damages and injuries becomes chronic.

The diversity of harmful agents. their abundance and damage caused depend also on the age of stands. The resistance of old trees usually decreases, although some diseases (poldery mildew, leaf blotch) cause more damage to young and middle-aged trees. Meanwhile, stem and other secondary pests and diseases are characterisitc of older, weakened due to unfavourable conditions trees (*Schizophyllum commune* in the stem wounds of American oak).

The general stand resistance to harmful agents depends on species composition. In this respect mixed stands are more resistant, because some pests due to a limited mobility face difficulty in covering bigger distances (Рупайс 1961). In a mixed stand the conditions are usually more favourable for beneficial organisms. Besides, introducents mostly increase the resistance of a mixed stand, because often they are rather resistant to local pathogens (sycamore and ashleaved maple as well as American oak are more resistant to powdery mildew and leaf blotch than local species of maple and oak).

According to the naturalization scale (6 grades) of alien plants by L. Januškevičius (2002). some studied trees, *i.e.* sycamore. ashleaved maple and black locust may be considered as completely naturalized in Lithuania, while other species, *i.e*. American oak, European beech, butternut – sucessfully acclimatized in Lithuania (Januškevičius 2002). According to L. Januškevičius, these species are not agressive in respect of autochtonous species and cause no danger to local biocoenoses. Z. Gudžinskas most of the species (*Acer negundo*. *A. pseudoplatanus*. *Fagus sylvatica*. *Juglans cinerea*. *Populus canescens*. *Quercus rubra*. *Robinia pseudoacacia*) ascribes to invasive species in Lithuania, *i.e.* considers these plants to be harmful for local flora (Gudžinskas 2004).

The necessity of each studied species in certain forests should be well considered. Trees of all the species could be grown in Lithuanian forests for biodiversity enrichment.

Tree (black locust, sycamore maple) resistant to air pollution are planted in forests (Jonava forest district) where it is necessary to substitute local species which are not so resistant to industrial pollution (pines). Besides, black locust could be grown in poor sandy, degraded soil, as a plant which lives in symbiosis with nitrogen-fixing bacteria and is a good ground improver; also on slopes, where its shoots would reinforce them (Šimkūnaitė 1962, Ramanauskas 1973).

Ashleaved maple. as providing low-value timber and having short rotation, but its needs in soil fertility being somewhat low, resistant to climatic conditions, viable and easily self-regenerating (Ramanauskas 1973, Navasaitis and Navasaitis 1979) may be grown in forests in the zones of industrial pollution to enrich biodiversity and improve the soil (rather abundant foliage) (Десслер 1981).

Sycamore maples may be grown in forests for fuelwood, as well as underbrush tree for biodiversity enrichment and soil improvement.

European beech could be grown more widely in the western part of Lithuania. especially planting seedlings derived from locally reproduced nuts, which are more resistant than these brought from abroad (Navasaitis 2004).

Since 1953 it was attempted to grow in Lithuanian forests wallnuts of several species. Only butternut and heterozic hybrids turned out to be perspective for timber production (Ramanauskas 1964. Ramanauskas 1973).

American oak is an example when introduced species turn out to be more resistant to diseases than the local species (Iršėnaitė and Treigienė 2000). Given the fact that the 50-year-old American oak produces over 300 m^3/ha and is more resistant to pests and diseases than pedunculate oak, its presence in forest plantations is desired.

In establishing introduced broadleaves in our forests. the level of damage depends on sanitary-hygienic and silvicultural measures (thinning, pruning, elimination of the outbreaks of pathogens, protection against damage caused by deer and rodents).

Due to intensive damages by pests and diseases every year, or due to increasing chronic abundance dynamics some species of introduced trees were considered to be non-perspective:

Poplar species of *Leuce* sub-genus, *i.e. Populus tremula. P.tremuloides. P. alba* and their hybrids are grown in almost all Europe and in North American countries becouse of their natural range.

The natural range of white poplar (*Populus alba*) reaches Minsk and goes to the south of Central and South Europe, Middle East. China and northern Africa.

Aspen (*Populus tremula*) and especially its interspecific hybrids *P. tremuloides* × P. *tremula, P. tremula* × P. *alba, P. alba* × *P. tremula,* as compared to other soft broadleaves, are characterized by high growth rate and biomass productivity. The most important factor limiting the use of aspen and its hybrids as well as growing of aspen stands is mass spreading of stem rot. The most widespread fungus causing the greatest damage is *Phellinus tremulae* (Bond) at Baris) which induces central stem rot. Besides, central stem rot is caused by *Ph. igniarius. Ph. igniarius* develops on growing aspen stems, however, its damage is limited. *Phellinus igniarius* damages not more than 8% of aspens, while *Ph. tremulae* induces mass damage of stands. *Ph. Tremulae,* differently than *Ph. Igniarius,* enters the stem through openings formed by dry branches, where the conditions are suitable for the germination of spores and initial growth of the mycellium.

A serious damage is caused also by the rootwood rot, which (apart from *Phellinus tremulae*) is induced by the whole series of other fungal agents: *Ganoderma applan*atum (Pers.) Ex Walls) Pat.; *Bjerkaudera adusta* (Willd. Ex Fr./Karst.; *Inonotus rheades* (Pers.) Bond Et Sing.). Trees are infected with rootwood rot causing fungi only through damaged roots and butts. Such damages may be caused by different machinery used in forestry. However, the main entodamagers are: *Aegeria epiformis* and *Saperda carcharias.* The developed larvae of *Aegeria epiformis* most often make pathways in the roots of poplars and aspens, through which fungus infection may enter the wood. The larvae of *Saperda carcharias* make wide pathways in the butts of trees up to 150 cm in height. Through the pathways trees get infected with fungi causing butt rot (Vitkūnas 2005).

American oak (*Quercus rubra*) could be grown in Lithuania. Its fast and luxuriant growth, resistance to adverse environmental factors, plasticity towards soil, high productivity and valuable timber, as well as tolerance to other species provides the preconditions to grow it on former farmland and eroded land. However, successful growing of American oak for merchantable timber without selection measures may be risky.

Conclusions

1.Trees species (*Robinia pseudoacacia. Acer pseudoplatanus. A. negundo*) resistant to air pollution should be grown in forests where it is necessary to substitute species (pines) irresistant to industrial pollution, to enrich biodiversity and improve the soil.

2.Fagus sylvatica, the natural range of which is close to Lithuania, could be more widely grown in the western part of the country, especially using seedlings derived from locally reproduced nuts, which are more resistant than these brought from abroad.

3. *Populus alba* hybrids (*P.alba* X *P.tremula ir P.tremula* X *P.alba*) aresentially less infected by *Phellinus tremulae,* which cause stem rot. Infection of these hybrids with stem rot and its spreading is far slower, as compared to *P.tremuloides* X *P.tremula* and *P.tremula* X *P.tremula* hybrids. It must be noted that the butt of *P.tremula* X *P.alba* hybrids is even several times less frequently attacked by the larvae of *Saperda carcharias*.

4.Among *P.alba* X *P.tremula and P.tremula* X *P.alba* hybrids quite often are found trees free from damages either by butt or stem rot. It is especially characteristic of hybrids with clearly expressed *P.alba* phenotypic traits. For some of the hybrids, stem rot agents were not found even in the presence of large and old mechanical damages. These hybrids may be successfully grown in Lithuanian forests.

5.According to the pathological conditions, American oak (*Quercus rubra*) could be grown in Lithuania. Its fast and luxuriant growth, resistance to adverse environmental factors, plasticity towards soil, high productivity and valuable timber, as well as tolerance to other species provides the preconditions to grow it on the former farmland and eroded land. Successful growing of American oak for merchantable timber should be practised using selected seedlings.

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ПАТОЛОГИЧЕСКОЕ СОСТОЯНИЕ ИНТРОДУЦИРОВАННЫХ ЛИСТВЕННЫХ В ЛЕСАХ ЮГО-ЗАПАДНОЙ И ЗАПАДНОЙ ЛИТВЫ

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Резюме

В лесах двенадцати лесничеств Юго-западной и Западной Литвы в 2003 – 2005 г. исследованно состояние интродуцированных лиственных родов *Acer, Juglans, Fagus, Quercus, Phellodendron, Populus, Robinia*. Установлено, что патологическое состояние исследованых лиственных хорошее. На основе полученных данных целесообразно в упомяннутых частях Литвы их выращивать вместе с местными породами для обогащения биологической разновидности и улучшения лесных почв. В местах промышленного и транспортного загрязнения перспективными яаляются деревья рода *Acer,* а также *Robinia pseudoacacia, Juglans cinerea, Fagus silvatica, Quercus rubra*. Успех аклиматизации некоторых исследованных пород ограничивается биотическими (вредители. болезни) факторами.

Ключевые слова: интродукция, лиственные породы, болезни, вредители, состояние.