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Pest and diseasses in willow plantation. A case study from Didactic Station Timisoara

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Abstract The paper presents the result about pest and diseases on willow plantation. Fourteen willow hybrids and local genotypes were established in spring 2015, in Timisoara Didactic Station of BUASVM: three Romanian hibryds from National Institute for Research and Development in Forestry "Marin Drăcea" (RO892, RO1077, RO1082), four Romanian willow genotypes from CHPs Govora (Cozia, Fragisal, Pesred, Robisal) and seven Swedish willow hybrids (Inger, Jorr, Olof, Sven, Tora, Tordis, Torhild). Many harmful insects have been observed in willow plantation: leaf feeding insects that produce immediately a negative impact about yield and plant physiology (Melasoma spp.) sucking insects like species from Aphidae or xylophagous insects (Sapeda populnea). Damage of young leaves or twigs are frequently made by Arachnide. Diseases of shoot and leaves caused especially by Uncinula salicis, Pollaccia (Fusicladium) saliciperda and Marssonina salicicola were also observed. I order to obtain resistent clones to pest and diseases, the behaviour of different willow genotypes should represent the starting point in breeding programme.

Key words

willow, pest, diseases, SRC.

A large genus, with more then 300 species worldwide, *Salix* is well represented in our coutry also, with about 40 species, most of them schrubs (Stanescu, 1977). Willows are used for wood plantation, cellulose and paper production, in pharmaceutical industry, for soil phytoremediation, like pioneer species by their role in ecosystem restoration, increasing biodiversity and for biomass production (Berg, 2002). In our country, willow SRC for biomass production started after 2005 (Nicolescu *et al*., 2015). There are about 800 ha of willow SRC, 400 ha of them are in Banat area (Hernea et al., 2015). All of these cultures were established with Swedish clones, especially clone Inger (Nicolescu *et al*., 2015). One of the challenges of SRC is increasing the yield by protecting willow plantation from pathogen attack (Wickham, 2010). There are a lot of diseases and pests in willow short rotation coppice: Marsonina leaf spot (*Marsonnina spp.*), powdery mildew (*Uncinula salicis*) and leaf rust (*Melampsora spp*) respectively the giant willow aphid (*Tuberolachnus salignus*), the black willow aphid (*Pterocomma salicis*) poplar-and-willow borer (*Cryptorhyncus lapathi),* blue willow beetle (*Phratora* vulgatissima), the brassy willow beetle (*Phratora vitellinae*), the brown willow beetle (*Galeruccela lineola*), small poplar borer (*Saperda populnea*), fall webworm (*Hypantria cunea*), gypsy moth (*Lymantria dispar*) (Anselmi 2009, Wickham et al. 2010).

One of the most important diseases causing an important yield reduction is leaf rust (Pei 2008). Widespread in Europe is also Marssonina sp. Marssonina leaf spot and leaf rust infect leaves and shoots. Usually leaves are infected by these pathogen and then these are prematurely withered. Powdery mildew infects the youngest tissues. Leaves become yellow, then brown and premature defoliation occurs but rarely this pathogen is fatal for plants. The giant and the black willow aphids debilitate willow by sucking the steam. Poplar-and-willow borer and small poplar borer are also a very serious pests causing severe steam damage. Usualy these wood boring insects go unnoticed until severe damage has resulted in the plants they are attacking. Leaf beetles (the blue, the brassy and the brown leaf beetles) usually cause partial defoliation by feeding the willows.

Fall webworm and gypsy moth defoliate willows and leave plants vulnerable to secondary fungal and insect invaders. They are very dangerous pests not only for willow but for others hardwood tree species (Netoiu and Chira 2009, Tomescu and Netoiu 2009).

Experience all over the world showed that resistance to pest and diseases is under genetic control and depend on local conditions. Only few researches were made in Romania on willow SRC pest and disease (Preda et al., 2013, Trava, 2014) so, in order to test the willow hybrids resistance to pest and diseases, a trial

experiment were established in Didactic Station of BUASVM Timisoara.

Materials and Methods

In 2015 a willow plantation was established in Didactic Station of BUASVM from Timisoara, Timis County Romania ($45^0$78' Lat. $21^0$21' Long.). The trail consisted of fourteen willow hybrids and local genotypes: three Romanian hibryds from National Institute for Research and Development in Forestry "Marin Drăcea" (RO892, RO1077, RO1082), four Romanian willow genotypes from The Fruit Growing Research and Development Unit of Vâlcea (SCDP Vâlcea) and CHPs Govora (Cozia, Fragisal, Pesred, Robisal) and seven Swedish willow hybrids (Inger, Jorr, Olof, Sven, Tora, Tordis, Torhild) from a Hungarian Nursery. The main characteistic of these genotypes (Caslin et al. 2012, Netoiu & Chira 2009) are presented in table 1. Biological material (46 cutting) was planted in double rows 0.75m apart with double rows spaced at 1.5m and an 0,8m in-row spacing for each hybrid. In order to identify resistant willow hybrids/clones, the assesment of diseases and the harmful potential of insects population in willow experimental plantation have been done. No pesticides treatments have been applied.

Table 1

Clone/local genotype, origin, parents

No	Name	clone/local genotype	Parents
1	RO 892	clone	*Salix alba* L. (RO – 204) X *Salix alba* (RO - 202)
2	RO 1077	clone	Salix fragilis L. (RO - 605) x S. matsudana Koidz (405)
3	RO 1082	clone	*Salix fragilis* L. (RO - 605) x *S. matsudana* Koidz (405).
4	Cozia_1	local genotype	N/A
5	Fragisal	local genotype	N/A
6	Pesred	local genotype	N/A
7	Robisal	local genotype	N/A
8	Inger	clone	SW911066 - *S. Triandra x Jorr*
9	Jorr	clone	L 820332 x L 81102 *S. viminalis*
10	Olof	Clone	Bowles Hybrid *S. viminalis x* Bjorn
11	Tora	Clone	L79069 *S. schwerinii x* Orm
12	Tordis	Clone	Tora x Ulv
13	Torhild	Clone	Tora x Orm
14	Sven	Clone	Jorunn x Bjorn

Results and Discussions

There are several factors involved in yield reduction of the willow short rotation coppice: weeds, pests and diseases. The main pests and diseases identified in willow experimetal plantation were (Fig.1): Marssonina leaf spot, powdery mildew, Venturia blight of willow, small poplar borer, poplar leaf beetle and Arachnid sp. The frecvency (%) of pest and disease is graphical represented in fig.2.

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Fig. 1. Exemple of pests and diseases in experimental willow plantation: a-powdery mildew; b- small poplar borer; c-poplar leaf beetle

Fungal pathogens may caused roots, steam and branches or leaves and shoots diseases. Venturia blight of willow and Marssonina leaf spot are the most important diseases of shoots and leaves and caused spring defoliation. Both of this diseases are presented in all genotypes but with different intensity. High frecvency of venturia blight of willow are found on Swedish clones, expecialy Torhild (75%), Tora (77%), Sven (90%) and Tordis (95%). In Romanian genotypes, the frecvency on this fungus is low, less then 50%. Not the same results were obtained in the South of Romania where no frecvency of Marssonina leaf spot was registreted. We have to notice that in this case pesticides treatements have been manually applied (Preda *et al.*, 2013). The other sever fungus has a complete different presence, the Swedish clone are more resistant than Romanian ones. Only clone Olof has a percentage of 83, close to Romanian genotypes Robisal (86%), RO1077 (88%) and RO1082 (88%). In term of powdery mildew, infection occures only to some clones and genotypes and the frecvency is quite low: Tordis - 13%; Inger and RO892 - 12%; Jorr, Olof, Torhild, Sven and Pesred – less than 10%.

Pests caused wither and leaves fall, the result of their repeatedly attacks is a reduction of plant vitality.
Small poplar borer were identified an all Swedish clones with different frecvency, from 37% - Olof, 29% - Tora, 25% - Tordis to 7% Sven. The infestation of Romanian gentypes were very low, only 2% for hybrids Ro892, RO1077 and RO1082 and no infection for the others genotypes. Small poplar borer attack large shoots so we have to notice than the four genptypes where the pest has not been found showed the smallest biometric characteristic. Poplar leaf beetle adults feed leaves and larvae skeletonize the leaves. His presence was notice an majority genotypes with a higher intensity in Romanian genotypes. The Swedish clone was not very affected by this pest. Not the same thing we can say about arahnids. Their presence were noticed on all genotypes with a frecvency range between 18% (Tordis) and 32% (Inger) for Swedish clones and 14% (Pesred) and 46% (RO892) for Romanian genotypes.

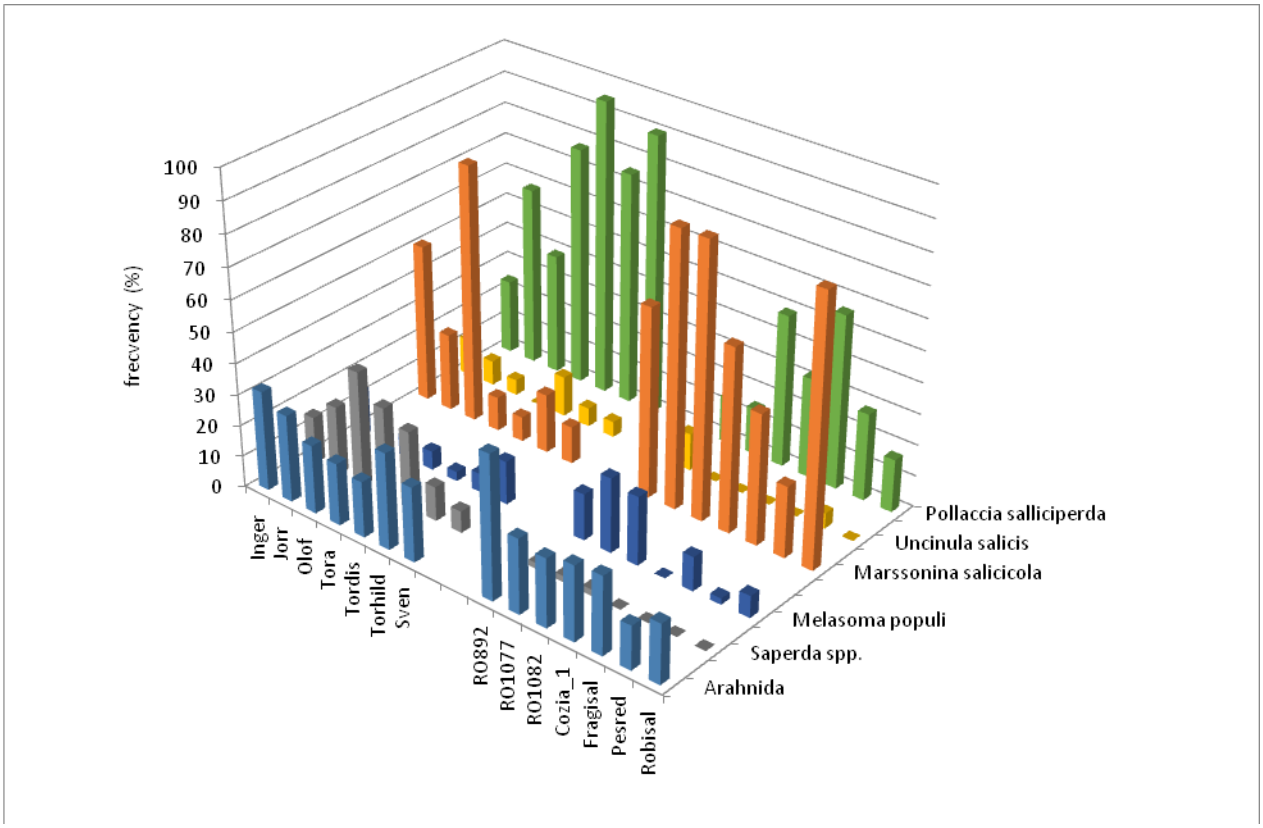

Fig. 2 Main pests and diseases frecvency in experimental willow plantation

Conclusions

Results obtained in willow plantation showed that in the specific climatic condition of year 2015, most of the genotypes have been infected with *Pollacia saliciperda*. The frecvency of the attack were very high for Swedish hybrids, except the hybrid Inger. *Marsonnina salicicola* were another disease who cause serious damage, expecially in Romanian hybrids and genotypes, Swedish hybrids were low affected.

Pest cause also damage on willow. All the genotypes were affected by different mites. A medium damage was produce by *Saperda populnea* to Swedish hybrids and by *Melasoma populi* to Romanian ones. The others genotypes were low damage.

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