

Sea buckthorn pests and diseases in Belarus

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ABSTRACT

Results of phytosanitary monitoring of sea buckthorn plantation at the Institute for Fruit Growing showed that the most harmful pest appeared to be seabuckthorn fly (*Rhagoletis batava obscuriosa* Kol). The pest is capable to damage 21.5-87.2 % of the harvest depending on the variety. No varieties resistant to sea buckthorn fly were revealed. Green sea buckthorn aphid (*Capitophorus hippophaes* Walk.) and sea buckthorn psylla (*Psylla hippophaes* Frst.) are also widely-spread pests. In certain years wood leopard moth (*Zeuzera pyrina* L.), common lackey (*Malacosoma neustria* L.) and European leafroller (*Cacoecia rosana* L.) were observed.

The most widely-spread sea buckthorn disease is a wilt (pathogens – fungi from genus *Verticillium* Nees. and *Fusarium* Link.). The disease caused 100 % death of the plants in some varieties.

As a result of resistance estimation to the wilt 42 varieties and hybrids were divided into 4 class: relatively resistant, weakly susceptible, medium susceptible, highly susceptible. Weakly susceptible varieties were dominant – they accounted for 46% of the varieties. 14.3% of the varieties ('Desert maslichnyi', 'Zolotoi klyuchik', 'Yolochka', 'Mendelevskaya', 'Syurpriz Baltiki', hybrid 11-28-00) were relatively resistant to the wilt. In certain years "endomycosis" was harmful to the fruits. The fruit damage degree was 7-75%.

Key words: *Hippophaë rhamnoides*, specialized pests species, "endomycosis" of fruits, wilt, resistance, variety

INTRODUCTION

A certain species composition of pests and diseases is typical for each region of sea buckthorn cultivation. It is variable in course of time because of cultivar introduction and change of climate conditions and cultivation technologies. Data on a species composition, domination structure of phytophages and phytopathogens in sea buckthorn plantings in Belarus have fragmentary character (Garanovich 1992, Shalkevich 2001, Garanovich *et al.* 2009). Increase of prevalence and injuriousness of diseases and pests is observed in different countries (Singh V. *et al.* 2008, Shamanskaya 2009, Kauppinen 2013). A decisive role in prevention of crop shortage and fruit quality deterioration belongs to measures confining number and development of phytophages and phytopathogens. Selection of resistant varieties is one of them.

The purpose of this research was to specify the species composition and domination structure of phytophages and phytopathogens in sea buckthorn plantations and to reveal resistant varieties against the most harmful pests and diseases.

MATERIALS AND METHODS

The research was carried out at the Institute for Fruit Growing within 1995-2014 where sea buckthorn trees of 42 varieties and promising hybrids of a various genetic and geographical origin are situated. The plants were planted at the experimental fields in 1992, 1996, 2006 and 2008. The amount of plants in each variety was 6-20. The planting scheme was 4 × 2 m (1250 plants / per ha).

The records of diseases and pests were carried out by annual route investigation during the vegetative period by the methods developed in M.A. Lisavenko Research Institute of Horticulture for Siberia (Orel 1999). Development of diseases was estimated by the formula generally accepted in phytopathology. Grouping of varieties for wilt and "endomycosis" resistance were carried out by the methods of N.I. Vavilov Research Institute of Plant Industry (Khokhryakova *et al.*, 1972). Distribution of varieties and hybrids on susceptibility to sea buckthorn fly was carried out according to the List of Descriptors for the species *Hippophaë rhamnoides* L. (St.-Petersburg, 1993).

RESULTS AND DISCUSSION

As a result of investigation there was revealed the damage of sea buckthorn plants by green sea buckthorn aphid, sea buckthorn psylla, wood leopard moth, common lackey, European leafroller and sea buckthorn fly. Sea buckthorn fly is the most dangerous pest in the regions of natural and cultural areas. In Belarus this pest was noticed in 2010 for the first time and that was caused by stable increase of daily average air temperatures up to + 19 °C in the period from the 2nd decade of June till the second decade of August. In subsequent years its number has increased (Figure 1).

The outbreak of pest and increment of its number and injuriousness within the last four years has been noted in industrial and experimental sea buckthorn plantings in some other European countries like Poland, Lithuania and Germany. No variety not damaged by the seabuckthorn fly has been found. The pest is capable to damage up to 21.5-87.2 % of the harvest depending on a variety. The varieties were divided into 4 classes by the degree of pest resistance (Table 1).

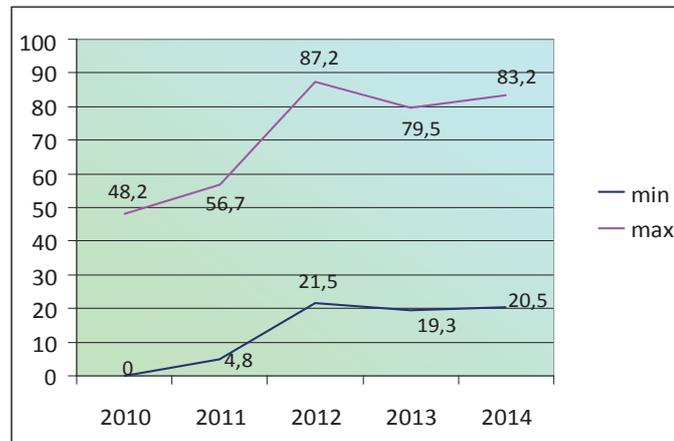


Figure 1. Fruit damage rate by the sea buckthorn fly (%) during the investigation period.

Table 1. Distribution of sea buckthorn varieties on resistance degree to *Rhagoletis batava* Hering

Resistance classes	Fruit damage rate, %	Variety, hybrid
Highly resistant	21.5-25.0	'Baikal', 18/89, 114-2008-02
Medium resistant	26.0-50.0	'Botanicheskaya', 'Dar Kazakovu', 'Mariya', 'Riabinka', 'Syurpriz Baltiki', 'Zheltoplodnaya', 'Zhyoltaya rannyaya', 'Zolotaya kosa', 'Zolotoi klyuchik', 15/88, 03-22-00
Susceptible	51.2-71.3	'Desert maslichnyi', 'Karamelka', 'Dyuimovochka', 'Mendeleevskaya', 'Nivelena', 'Plamennaya', 'Petrovka', 'Podarok sadu', 'Vasilisa', 'Yolochka', 'Zarevo', 7/71, 21/90, 38/90, 11-28-00
Hyper susceptible	81.3-87.2	'Trophimovskaya', 'Finskaya'

Green sea buckthorn aphid and sea buckthorn psylla are widely-spread pests as well (Figure 2). Caterpillars of leaf-eating lepidopterans (*Archips rosan* L. and *Zeuzera pyrina* L.) are spread sporadically in sea buckthorn plantings. Number of this group of pests did not exceed 0.6 caterpillars per 2 m of branches and 0.1 % of damaged shoots during the research years.

The most widely-spread disease in sea buckthorn plantings is the wilt (drying), caused by fungi from genus *Verticillium* Nees.; *Fusarium* Link. (Shamanskaya 2009); *Corineum elaeagni* Jacz. (Khovalyg 2005); *Stigmia* Sacc. (Kauppinen 2013). Non-infectious types of sea buckthorn wilt were diagnosed as well with damage of plants up to 100 % (Kondrashov 1996). According to E.M. Drozdovski and I.A. Eremenko (1983) young plants die of root rot and adult plants die of *Verticillium* wilt which is complexed with some other factors. Fungi from genus *Fusarium* Link. – *F. Culmorum* (W.G.Sm.) Sacc., *F. Sumbucinium* Fack., *F. Oxysporum*, *F. gibbosum* (Garanovich *et al.*, 2009) and *Verticillium* Nees. and bacteria *Pseudomonas syringae* (Shalkevich, 2001) were revealed in plant samples with wilt symptoms during the investigations carried out in Belarus. The studied varieties and hybrids had various wilt resistance (Table 2).

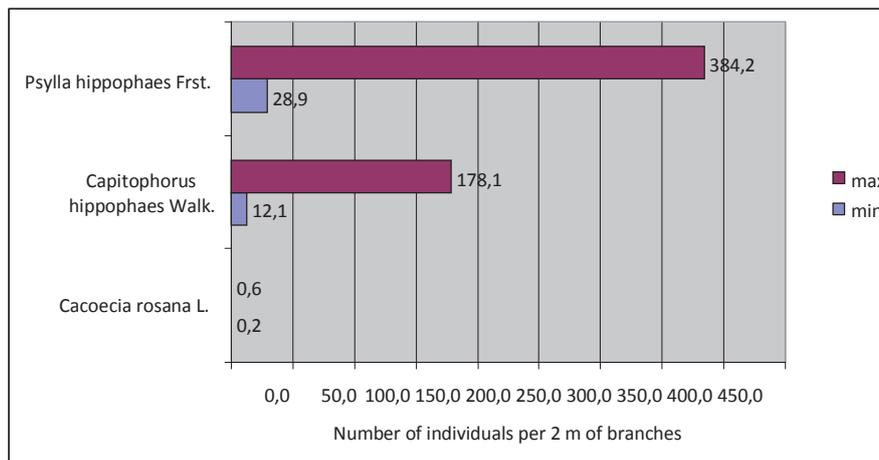


Figure 2. Number of sea buckthorn pests during the investigation period.

Table 2. Distribution of sea buckthorn varieties on resistance degree to wilt

Resistance classes	Disease development, %	Variety
Relatively resistant	0-8,3	'Desert maslichnyi', 'Yolochka', 'Mendeleevskaya', 'Syurpriz Baltiki', 'Zolotoi klyuchik', 11-28-00
Weakly susceptible	12.5-25.0	'Baikal', 'Botanicheskaya', 'Dyuimovochka', 'Finskaya', 'Gaspadar', 'Karamelka', 'Mariya', 'Nivelena', 'Plamennaya', 'Riabinka', 'Trophimovskaya', 'Vasilisa', 'Zarevo', 'Zheltoplodnaya', 20/88, 10/86, 15/88, 21/90, 4/87
Medium susceptible	31.7-50.0	'Dar Kazakovu', 'Priokskaya', 'Otradnaya', 'Zhyoltaya Rannyaya', 23-34, 38/90
Highly susceptible	53.3-87.5	'Botanicheskaya luchistaya', 'Inya', 'Krasnoplodnaya', 'Kudri-na', 'Lomonosovskaya', 'Petrovka', 'Podarok Sadu', 'Vorob'yovskaya', 'Zolotaya kosa', 18/89, 7/71

In certain years "endomycosis" (decoloration and softening) of fruits does a significant damage. The disease is caused by saprophyte micro-flora, represented by the following species: *Aureobasidium pullulans* (D.B.) Ar. El., *Penicillium cyneotuhum* B. Rap. Thorns, *Penicillium rubrum* Stadt. Rap. Thorns., *Aspergillus niger* V. Fieg. Rap. Fen., *Trichoderma viride* Pors, Ritai., *Alternaria alternata* (Fr.) Keissler (Shamanskaya, 2009). In our investigations "endomycosis" of fruits was observed annually. The fruit damage degree was 7-75%. The majority of the studied varieties showed relative resistance (disease expansion was not more than 10%). The most susceptible varieties were 'Botanicheskaya', 'Mendeleevskaya' and 'Yolochka'.

Thus, the most harmful pest was defined to be sea buckthorn fly and the most harmful disease the wilt. The varieties most resistant to the pest ('Baikal', 18/89, 114-2008-02) and to the disease ('Desert maslichnyi', 'Yolochka', 'Mendeleevskaya', 'Syurpriz Baltiki', 'Zolotoi klyuchik', 11-28-00) were revealed. The further researches directed on perfection of methods for diagnosis and selection of resistant varieties as well as for biological techniques of plant protection are highly required.

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