PLANT PROTECTION

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PHYTOSANITARY STATE RATING OF LAVANDIN INDOORS

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Intrpduction

The main regions of lavender cultivation are England, France, Italy, Spain, Bulgary, the Crimea and Krasnodarsky krai. Essential oil (EO) contained in its new inflorescences (1,2-2,3%) makes lavender especially valuable (main components: linalool and linalilacetate). Principal EO components are widely used in perfume and food industry, medicine [1,3]. Lavender is an evergreen plant, light- and warm-requiring, draught-resistant; mature plant can resist even hard frosts (-25°C). Poor soils of light and middle granulometric composition are quite favorable for lavender, while heavy soils with groundwater occurance near the surface aren`t quite proper [13].

Propagation method of lavender is cutting, plantings are setting in autumn. Lavender is being operating for 20 years starting with the second year of vegetation. Each 6-7 years plantations are renewed: in spring bushes are cut 3-5 sm high. Yielding happens during mass blooming [12].

Lavender is originated from Mediterranean [10]. And over all cultivation regions, *Lavandula angustifolia* Mill. is mainly cultivated. *Lavandula latifolia* Medic. is not so widespread and can be found only in collection plantings of botanical gardens and other research establishments. Both cultivars are parent forms of lavandin, though have sharp differences in morphological and biochemical peculiarities [10]. *Lavandula angustifolia* Mill. contains high-quality essential oil with 40-50% of esters and 40% of unsaturated terpenic alcohols [7, 8]. *Lavandula latifolia* Medic. is more drought-resistant and longevous in comparison with *Lavandula angustifolia* Mill., but not so frost-resistant (stands frosts till -16°C).

Scientists of “Aroma and medicinal plants” laboratory in Nikita Botanical Gardens successfully bred sorts of *Lavandula angustifolia* Mill. “Record” and “Prima”, intensively used for lavandin production. They are characterized by high winter-resistance, efficiency and high-oil concentration. Its oil rating in perfume industry reaches 4,5 points [10].

Lavandin is an interspecific hybrid of lavender, well-known even since XVIII century [7, 9]. It is one of perspective oil-bearing plants, as best lavandin clones exceed lavender 1,5-2 times in crop capacity and essential oil content, while EO yielding per hectare – 4 time [12]. Essential oil, the main cause of lavandin cultivation, is appreciated on the world market, its demand increases year by year [8, 10]. Lavandin EO possesses fresh herbaceous and tarry touch, lower but intensive flavor in comparison with lavender fragrance. It is commonly used in perfume industry and medicine [3, 9].

As a result of experimental researches scientists of “Aromatic and medicine plants” laboratory bred interspecific hybrids of lavender with various number of initial cultivars genomes and in different combinations [10, 11]. Study research was to identify biocomplex

of diseases and pests effecting this crop and comparison of damage level on lavender and lavandin study specimens, cultivated indoors.

Objects and methods of the research

Researches were carried out in "Enthomology and phytopathology" laboratory of NBG-NSC during spring 2015. Study objects were sorts of *Lavandula angustifolia* Mill. (Record, Prima, Belyanka) and lavandin specimens with different number of genomes in initial cultivars ("Aromatic and medicine plants" laboratory) with a range of damages, planted in the greenhouse.

Analysis of damage level was based on "Linear rate" of observing the cut specimens in the greenhouse what is the determine factor for protective steps [5].

Extraction of phytopathogens isolates was conducted out of root zone, segment of root collar, stem shoots and leaves. Method of "Accretion" was applied to analyse infected inside tissue: material pieces of study crops, 2 mm, were being sterilized in concentrated solution $KMnO_4$ or in alcohol solution for 10-15 sec. After washing in sterile distilled water isolates were put on the surface of Ka and Czapek's mediums in Petri cups. Bacterium colonies or myceliums developed around objects were sifted out onto uninfected plants for further investigation [2].

Shtemerding method was applied to reveal active stage of endoparasitic nematodes, created galls on lavandin roots. It makes possible to intensify nematode output getting macerative tissue out of infected plant part. This suspension is carefully filtered, sediment is shifted into funnal or Oostenbrink`s cup [5]. Output of active nematodes is over in 2-3 days.

Results and discussion

Study analysis revealed that recessive form of *Lavandula angustifolia* Mill., sort "Belyanka" is the least infective disease- and pest-resistant (damage level – 75%). Sort "Record" presented not so high damage level – 40%, allohaploid (lavandin Temp) – 23%, quite resistant was allotriploid with two genomes of *Lavandula angustifolia* Mill. and one genome of *Lavandula latifolia* Medic. – 11%. Amphidiploid was found the most damage-resistant; it includes two genomes of *Lavandula angustifolia* Mill. and two genomes of *Lavandula latifolia* Medic. (damage level – 5%) (table 1).

Table 1

Disease damage leel of lavandin specimens indoors

№	***Specimen***	***Form***	***Cut***		***Dying out, %***
			Total amount	Damaged	
1	Belyanka	*sort*	115	86	75
2	Record	*sort*	107	43	40
3	Lavandin Temp	*allohaploid*	93	22	23,7
4	Lavandin	*allotriploid*	65	7	11
5	Lavandin	*amphidiploid*	84	4	**5**

Disease signs were found on all tissue types of dying out plants. Stem was drying up, pale brown with gray coating. Down leaves started intensive fading. Small zone of green viable shoots was fixed on the top of the bush what concerns ascending development of disease (fig.1).

Fig.1 Lavandin Temp bush with damage signs

Root collar had some symptoms of wet rot. Applying section of root zone revealed larvas of Phytometra-gumma (fig.2).

Fig.2 Place where larva of Phytometra gumma was found

In the center of root on its fibrils there were a huge number of nodes – galls (fig.4). High concentration of gall nematode (*Meloidogyne spp.)* was revealed in terms of laboratorial analysis.

Fig.4 Lavandin root with numerous galls, generated by nematodes

Colonies of phytopathogenic bacterium **(***Erwinia sp*. genus) which cause wet rot of plants were sampled from the zone of root collar [2]. It`s a well-known fact that nematodes often come as bacterium carriers which can provoke tissue maceration. At the same time phytopathogenic fangus - *Cephalosporium sclerotigenum* F.et R.Moreau – was found in stem (fig.5),that is a stem fading agent of industrial crops [6]. This agent causes damages of xylem waterworks with further dying of plants.

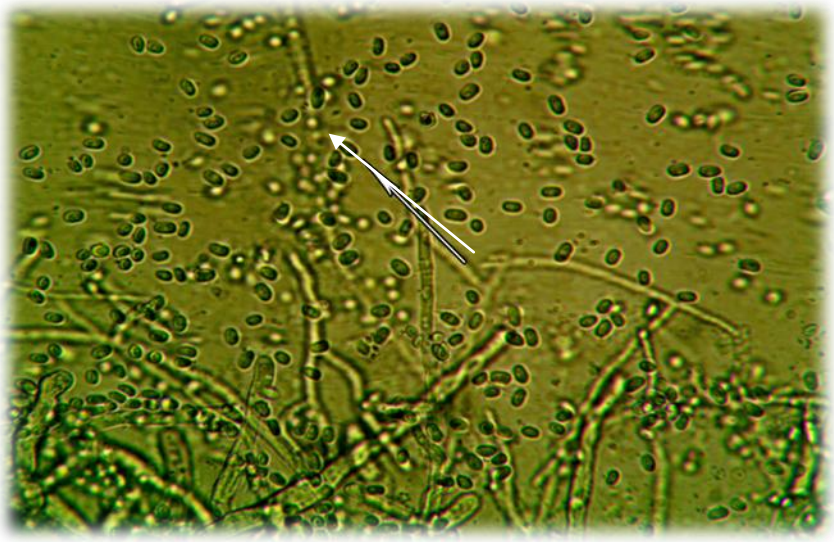

Fig.5 *Cephalosporium sclerotigenum* – fading stem agent. The arrow points fungus spores (conidia)

Fungi of *Alternaria* sp. genus were sampled from fading leaves and sowed. They cause botch and fading on many plants [4] and as a result considerably intensify infection load of damaged crops (Fig.6).

Fig. 6 *Alternaria* sp. – agent of blotch and leaf fading on lavandin. The arrow points fungi spores (conidia)

Conclusions

Interspecific lavender hybrids – lavandins, besides a number of advantages in comparison with parent forms are more resistant to disease caused by pests and phytopathogenic agents. The best results of immune level obviously belong to forms with bigger number of chromosomes [10]. Amphidiploid of lavandin having (2n=4x=AALL=96 chromosomes) 5% of damaged plant organs it is characterized with fertility. Allotriploid (2n=3x =AAL=72 chromosomes) – 11% of damaged plant organs, hybrids are sterile. Allohaploid (2n=2x=AL=48 chromosomes) – 23,7% of damaged plant organs, hybrids are sterile as well. Such hybrids could favor sanitation of planting and seed material.

Taking into consideration that sources of all infections, fixed on lavandin plants are well conserved in damaged plant residue, soil and seeds, carried onto other areas by means of equipment, the following plant protection measurements are necessary for lavandin sanitation being cultivated indoors: thermal disinfection of soil (steaming with 100°C for 3 hours), crop rotation with resistant crops, addition of high concentrated potassium fertilizers with microelements against gall nematodes, crops treating with fungicidal preparations to overcome bacterial infection indoors.

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Biocomplex of diseases and pests, typical for interspecific hybrids of Lavandula with various number of genomes was investigated in course of the research. Susceptibility of Lavandula and Lavandin specimens, cultivated in greenhouse were compared as well. Principal measurements of plant protection, necessary for improvement of Lavandin indoors were also determined.

Key words: *oil-bearing crops; plant protection; signs of susceptibility; phytopatogens; Lavandin; nematode.*

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POLLINATION FEATURES OF *ALLIUM SICULUM* SUBSP. *DIOSCORIDIS* WITHIN CRIMEA NATURAL PRESERVE

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Introduction

As traditional nature conservation measurements, aimed at preserve and renewal of biodiversity, study of pollination and seed formation (especially rare cultivars) with the help of insects-pollinators in nature preserves are of great importance. Especially protected natural territories is a special study model of exist historically developed, balanced concervative ties