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Ecological Aspects of the Development of Harmful Objects on Plants of Genus Chaenomeles (Rosaceae)

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Abstract. Currently, the cultivation of environmentally friendly products in agriculture is of great importance in the world. This article is devoted to the study of new cultivars of genus *Chaenomeles* in order to identify the ones most resistant to harmful organisms for cultivation in private and farm gardens. The pathogenic microflora and entomofauna were studied on the *Chaenomeles* Lindl. cutivars (Maloideae, Rosaceae), obtained at the Michurinsky State Agrarian University. In central Russia (Moscow and Tambov Region), many years of systematic monitoring of pathogens and phytophages were spent for plants *Ch. japonica*, *Ch. cathayensis*, *Ch. × superba*. Among the identified pathogens, the micromycetes belonging to genera *Botrytis*, *Cytospora*, *Diplocarpon*, *Entomosporium*, *Gloeosporium*, *Monilia*, *Neonectria*, *Penicillium*, *Pestalotia*, *Phomopsis*, *Phyllosticta*, *Septoria* and *Sphaeropsis* were found to be injurious. With age, the accumulation of infectious background, including viral diseases and the damaging entomofauna, was noted in the plantings of fruit crop *Chaenomeles*. The species composition of phytophages is mainly represented by autochthonous species (polyphages and oligophages), preferring plants of the Rosaceae family. Despite the abundance of species in the phytophage complex, it has a little effect on the decorative effect of *Ch. japonica*, *Ch. cathayensis* and *Ch. × superba*. No outbreaks of epiphytotics and epizootics were observed in the collections of *Chaenomeles* in different ecological growing conditions over a long period of time, and, in general, all plants were in a satisfactory condition. Entomophytopathological monitoring made it possible to identify environmentally safe *Chaenomeles* cultivars resistant to harmful objects - such as Albatross, Allure, Voskhod, Michurinsky Vitamin, Flagship and Charm.

Key words: Chaenomeles, microflora, entomofauna, cultivar.

Introduction

Species of genus *Chaenomeles* Lindl. (Maloideae, Rosaceae*)* come from Japan and China and are valued in decorative gardening. To obtain flowering cultivars, such cultivars as *Ch. speciosa* (Sweet) Nakai,

Ch. cathayensis (Hemsl.) C.K. Schneid., *Ch. japonica* (Thunb.) Lindl. ex Spach, as well as garden hybrids - *Ch. × superba* (Frahm) Rehder (Ch. *Japonica × Ch. speciosa*) and others were used (Garkava et al., 2000; Norin et al., 2002).

In the climatic conditions of Russia, the most stable species is Japanese Chaenomeles called "Japanese quince" - *Ch. japonica* (Thunb.) Lindl. ex Spach; it blooms with bright orange flowers and safely winters under a snow cover. This species is interesting for its highly vitaminized fragrant fruits and attracts breeders in Sweden, Finland, Poland, Spain, Baltic countries, Moldova, Belarus, Ukraine (Rumpen, 2002; Mezhinsky, 2004; 2010) and Russia. As an unconventional fruit crop *Ch. japonica* is tested in central Russia, the Middle Volga region, in the Crimea and Western Siberia (Saveliev et al., 2009; Fedulova, 2009; Komar-Dark, 2015; Kuklina et al., 2016, 2017).

Although it is believed that *Chaenomeles* species are resistant to diseases and pests, it is known from literature that, in China, the genus representatives *Phoma sp.* and *Phyllosticta sp.* (Yu & Bai, 1995) settle on bushes. The following pathogens were detected on plants of genus *Chaenomeles*: *Monilinia fructicola* (G. Winter) Honey, *M. fructigena* Pers., *M. laxa* (Aderh. & Ruhland) Honey, *Alternaria alternata* (Fr.) Keissl., *Botrytis cinerea* Pers., *Phyllosticta chaenomeli*na Thüm., *Cytospora piricola* Westend., *Septoria cydoniae* Fuckel, *Diplodia cydoniae* Schulzer, *Phoma chaenomeles* Brunaud, *Ph. pomorum* Thüm., *Ph. herbarum* Westend., *Ph. exigua* Desm. *Penicillium expansum* Link, *Sphaeropsis lichenoides* Sacc., *Ulocladium botrytis* Preuss, *Thubercularia vulgaris* Tode, *Ramularia sp.*, *Cladosporium sp.*, *Fusarium sp.*, *Asteromella sp.*, as well as phytophages *Aphis pomi* Deg., *A. fabae* Soper. Kalt., *Phyllobius sp.*, *Operophtera sp.*, *Yaponomeuta sp.*, *Caliroa sp.* in Europe (Rumpen, 2002) and *Aphis pomi* in Iran (Madachi & Sahragard, 2012).

For the successful breeding and a further expansion of this culture, information about diseases and pests that threaten nontraditional fruit crops is relevant. The purpose of this study was to research and identify representatives of pathogenic microflora and harmful entomofauna on the *Chaenomeles* cultivars in the regions of central Russia.

Material and Methods

The study of phytopathogens and phytophages on the *Chaenomeles* crops was carried out in the Michurinsk City, Tambov Region (Michurinsk State Agrarian University), Moscow Region (Orekhovo-Zuevo District, urban plantings) and in the arboretum of N.V. Tsitsin Main Botanical Garden of the Russian Academy of Sciences (Moscow, MBG RAS). The plantings of *Ch. japonica, Ch. cathayensis, Ch. × superba* were surveyed, as well as 25 selected Chaenomeles forms and 6 cultivars (Flagman, Voshod, Sharm, Michurinsky Vitamin, Alyur, Albatros) of the Michurin selection.

In 2007-2009, in the Tambov region, endophytic microflora was tested on cultivars, forms and types of *Ch. japonica* and *Ch. cathayensis*. Crops taken from annual shoots were placed in sterile tubes and Petri dishes with 2 variants of nutrient media from agar-agar (15 g): in the 1st variant with intoxicating wort (1 L) and in the 2nd - with potato (1 L). The analysis and registration of the fungal and bacterial microflora colonies was carried out under the microscope "Biomed-4" and expressed in (%) of the total number of tests (Fedulova, 2009).

In 2010-2017, in field conditions, the monitoring was carried out, including analysis of leaves and fruits on *Chaenomeles* samples with symptoms of phytopathogen lesions and phytophagous damage. The identification of fungi was performed by standard methods (Khokhryakov & Potlaychuk, 1984; Treivas & Kashtanova, 2014) and listed on Index Fungorum (2022). The species composition of arthropods (Arthropoda) is determined by damage, larvae and imago (Savkovsky, 1990; Isaeva & Shestopal, 1991), and the Fauna Europaea (2022) is also given. The affection of cultivars by diseases was estimated on a 5-point scale: 0 - there are no lesions on leaves and fruits; 1 - lesion area ≥10 %; 2 - lesions on the area is in the range of 11-30 %; 3 -

damages in the area is in the range of 31-70 %; 4 - damaged ≥70 % of the area, and shoots die off.

Results and Discussion

Since 2003, on the basis of Michurinsk State Agrarian University in the Tambov region, the breeding of *Chaenomeles* has been carried out (Fedulova, 2009). The cytological study of the first haploid mitosis in the pollen from selected forms of *Chaenomeles* showed that *predatirovnaiya?* pollen grains can be formed in flowers. This development of anthers provides an additional opportunity to obtain meiotic amphidiploids (Fedulova & Pimkin, 2016), potentially promising in further selection.

Stability of Russian Chaenomeles cultivars

New cultivars Flagman, Voshod (Fig. 1), Sharm (Fig. 2), Michurinsky Vitamin, Alur and Albatros are included in the State Register of the Russian Federation. They have the flowers of the original color, corolla diameter being 3.5-5.8 cm, and their shoots without spikes (Table 1).

These *Chaenomeles* cultivars are characterized by a universal purpose and can be considered as a fruit crop. Their fruits weigh 60-75 g with thick pericarps (1.3-1.9 cm), the pulp fraction is up to 88-92 % (Fig. 3). They (fruits) are saturated with vitamin C (110-350 mg %), contain 450-750 mg % of catechins, up to 120 mg % of leucoanthocyanins, about 5% of organic acids and 3.5 % of sugars, and are characterized by a low sugar-acid index, contain up to 12 % of pectin; so, they are suitable for various types of processing and are recommended for therapeutic and preventive nutrition (Kuklin & Fedulova, 2015; 2017).

Fig. 1. Bush of cultivar Voshod. Photo by Y. Fedulova.

Fig. 2. Inflorescences of cultivar Sharm. Photo by A. Kuklina.

Table 1. Characteristics of *Chaenomeles* cultivars.

Cultivar	Average bush height, cm	Corolla color	Average corolla diameter, mm	Average fruit diameter, mm	Average pericarp thickness, mm
Voshod	90	Pale- yellow	43	50	19
Flagman	40	Bright-crimson	35	50	20
Sharm	70	Light- orange	40	48	15
Michurinsky Vitamin	65	Creamy orange	45	42	20
Alyur	80	Orange	58	55	18
Albatros	70	White	38	45	14

Fig. 3. Fruits of cultivar Sharm. Photo by Y. Fedulova.

The selected *Chaenomeles* forms and cultivars, tested in the Tambov region for the resistance to endophytic microflora, showed a high plant viability degree (Chesnokova et al., 2010). The presence of bacterial and fungal microflora in different proportions, depending on the date of testing, was revealed on the shoots. Bacterial microbiota prevailed and varied greatly in color, size, shape of colonies, the nature of surface and the marginal zone. Fungal microflora, during this testing, was less abundant and was represented by the species of genera Alternaria (Fig. 4), *Penicillium sp.*, *Stemfillium sp.*, *Cladosporium sp.*, *Fusarium sp.*; some cultivars were absent in both media. Negative tests were recorded on the potato culture medium in cultivars Flagman, Sharm and Michurinsky Vitamin. Such cultivars as Alyur, Albatros and Voshod have only 10% of micromycetes, and that confirmed a good adaptability of these plants (Fig. 5).

Long-term monitoring of 6 *Chaenomeles* cultivars in the Michurin breeding under field conditions revealed 4 types of phytopathogens with a minimal plant susceptibility degree (Table 2).

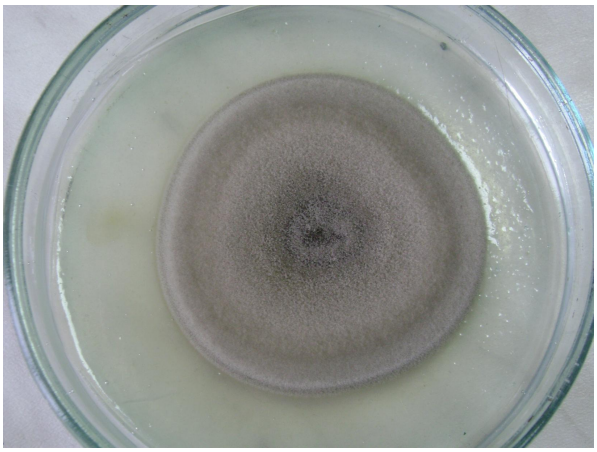

Fig. 4. Pure culture *Alternaria* sp. in a Petri dish on a wort nutrient medium. Photo by Y. Fedulova.

Table 2. Affection of *Chaenomeles* cultivars by the pathogenic microflora during 2010-2016, points.

Cultivars and forms	*Septoria cydoniicola*	*Alternaria alternata*	*Phyllosticta cydoniae* var. *cydoniaecola*	*Diplocarpon mespili*
Voshod	0	0	1	0
Flagman	1	1	0	0
Sharm	1	0	0	0
Michurinsky Vitamin	1	0	0	0
Alyur	1	1	1	0
Albatros	1	0	0	1

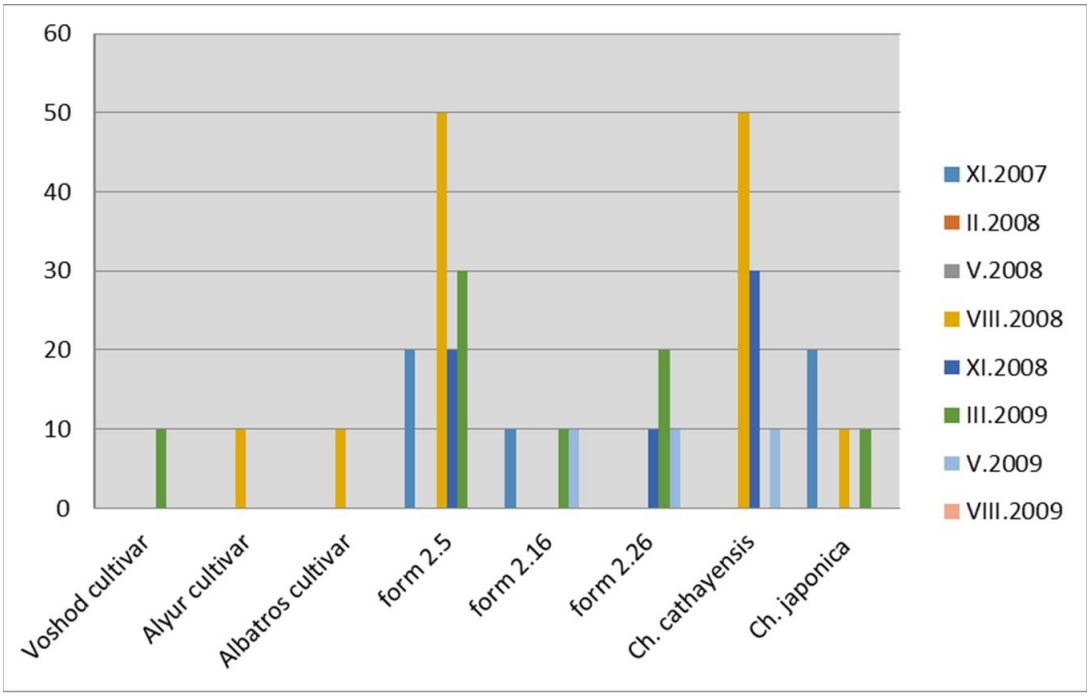

Fig. 5. Concentration of endophytic microbiota in *Chaenomeles* cultivars on a potato nutrient medium, %.

Septoria cydoniicola Thüm was most commonly found in *Chaenomeles* cultivars (*Mycosphaerellaceae*). At the beginning of summer, numerous whitish-gray round spots with a dark rim are formed on the leaves (Fig. 6). Cultivars were affected by the disease at 1 point, but Voshod turned to be the most resistant cultivar.

Drying and premature falling of leaves with brown spots with a light middle causes the appearance of *Phyllosticta cydoniae* var. *cydoniicola* (Allesch.) Cif. (*Phyllostictaceae*). The cause of the appearance of brown spots in new cultivars Flagman, Voshod (Fig. 1), Sharm (Fig. 2), Michurinsky Vitamin, Alu can also be entomosporiosis - the causative agents of *Entomosporium eriobotryae* S. Takim. and *Diplocarpon mespili* (Sorauer) B. Sutton, syn. *Entomosporium maculatum* forma *maculatum* Lev. (Dermateaceae), identified in cultivar Albatros (1 point).

More rarely, *Alternaria alternata* (Fr.) Keissl is encountered in *Chaenomeles* cultivars (*Pleosporaceae*). At the end of spring, small rounded dark brown spots with a dark purple-red border are visible on the leaves (Fig. 7), and, later, the spots merge. In the course of the disease development, fruit rot (Fig. 8) develops heart rot. The most resistant to altarnariosis cultivars are Voshod, Sharm, Albatros and Michurinsky Vitamin.

The assortment of fruit culture of *Chaenomeles*, unconventional for the *Chaenomeles* fruit crop of Russia, which is resistant to phytopathogens obtained in the Michurinsk State Agrarian University, can serve as basis for further breeding activities.

Fig. 6. *Septoria cydoniicola* and *Phyllosticta cydoniae* var. *Cydoniicola* on a *Chaenomeles* leaf. Photo by Y. Fedulova.

Fig. 7. *Alternaria alternata* on *Chaenomeles* leaves. Photo by Y. Fedulova.

Fig. 8. *Alternaria alternata* on the *Chaenomeles* fruit. Photo by Y. Fedulova.

Potentially dangerous microflora

According to our observations, the pathogenic mycoflora on *Chaenomeles* plants is represented much more widely and is capable of damaging leaves, flowers, fruits, causing the drying of branches and death of entire bushes. *Monilia fructigena* (Sclerotiniaceae), which is most often noted in the collection plantings of the Moscow Botanical Garden (MBG RAS), affects *Ch. japonica* and *Ch. cathayensis* (2-3 points). During the disease development, brownish-yellow pads of conidia sporification appear on the fruit surface (Fig. 9). Later, the fruit loses its taste and nutritional qualities, and its mummification comes. The causative agent of moniliosis can be *M. cydoniae* Schell., from which leaves, flowers and ovaries fall off in summer. Old *Ch. japonica* bushes are affected by 2 points.

As a result of anthracnose quince, the causative agent of *Gloeosporium cydoniae* Mont. (*Dermateaceae*), dark brown spots appear (3 points) on the leaves of *Ch. japonica*. The premature yellowing and leaf fall (2-3 points) cause *Pestalotia breviseta* Sacc. (*Pestalotiopsidaceae*). To a lesser extent (1 point), the fruit crop is affected by *Phyllosticta velata* Bubák. (*Phyllostictaceae*).

On the old *Chaenomeles* bushes, the following diseases are often encountered (1-2 points). Quince cytosporosis is the causative agent of *Cytospora cydoniae* Bubák & Kabát. (Valsaceae) that makes bush branches shrink. Tubercular necrosis is the causative agent of *Nectria cinnabarina* Fr. (Nectriaceae), begins with the bark necrosis on the shoots and branches, but leads to the entire plant death. European cancer, the causative agent of *Neonectria galligena* (Bres.) Rossman & Samuels, syn. *Nectria galligena* Bres. (Nectriaceae), is rare, and it causes the death of leaves, fruits and whole branches. Black quince cancer - the causative agent of *Sphaeropsis cydoniae* Cooke & Ellis (*Aplosporellaceae*) - damages the fruits of *Ch. japonica* and *Ch. cathayensis*, and it leads to the cracking and drying of branches bark.

Part of the *Chaenomeles* harvest may be lost (1-2 points) as a result of botrytiosis, penicillosis and fomopsis, which are noticeably manifested during the storage of fruits. Botrytiosis - the causative agent of *Botrytis cinerea* (Sclerotiniaceae), which is found everywhere, - affects the flowers and fruits of *Chaenomeles*. First, brown spots with a clear reddish edge appear, and then the fruits rot and fall premature. The fallen fruits rotting is accelerated by a contact with soil, since *Penicillium expansum* Link and *P. cyclopium* Westling (Trichomaceae) penetrate their surface. *Phomopsis mali* Roberts, *Ph. perniciosa* Grove and *Ph. ambigua* (Nitschke) Traverso (Diaporthaceae)

are phomopsis pathogens, and their presence is accompanied by the appearance of dark brown spots on the leaves, leaf fall and the rotting of *Chaenomeles*.

Only the tomato annular blotch virus (ToRSV), the symptoms of which are manifested in the form of chlorosis, wrinkling and necrotic leaf blotch with a characteristic alternation of dark and light areas, was observed in *Chaenomeles* (Fig. 10).

Fig. 9. *Monilia frutigena* with conidial sporulation pads on the fruit of *Chaenomeles japonica*. Photo by L. Treyvas.

Fig. 10. ToRSV virus on a *Chaenomeles japonica* bush. Photo by L. Treyvas.

Damaging entomofauna complex

A complex of entomofauna representatives was revealed in *Chaenomeles* plants in the regions of central Russia (Table 3). It should be noted that almost all groups of Insecta are rare and in a single amount (1 point), except for aphids forming colonies (1-2 points).

The most dangerous are migratory species *Aphis fabae*, black insect (Fig. 11), and the nonmigrating species *A. pomi* (Homoptera: Aphididae), which is common for Rosaceae fruit crops. Although they are not noted every year in *Chaenomeles*, they are a carrier of viral diseases. The complex of sucking species in the Moscow region is presented by the polyphage *Palomena prasina* (Homoptera: Pentatomidae) and the phytophage fam. Rosaceae - *Edwardsiana rosae* L. (Homoptera: Cicadellidae). In both regions, the polyphagous bug *Acanthosoma haemorrhoidalis* L. (Hemiptera: Acanthosomatidae) was found, usually feeding on deciduous plants of families Rosaceae, Betulaceae, Salicaceae, Tiliaceae, etc.

Gnawing phyllophages are diverse, although they appear sporadically, but they are capable of reducing the decorative appearance of a bush. At the beginning of summer, the gray-green caterpillars *Cladius pallipes* Lep., Syn. *Priophorus padi* L. (Hymenoptera: Tenthredinidae), capable of skeletonizing the leaves of *Chaenomeles*, appear.

Archips variegana Schiff stands out from leafworms (Lepidoptera: Torticidae) and *A. rosana* L., syn. *Ccoecia rosana* L., feeding on deciduous plants, including those from this Rosaceae family. The second type not only turns the leaves into a tube, cigar-shaped or lumpy, but also damages the ovary and fruit, gnawing the fossa in the pulp, to the seed chamber (Fig. 12).

An especially active development of caterpillars *Acleris variegana* Den. et Schiff. was noted by us in 2016 in the Tambov region on the Albatross cultivar, when they were eating out fruit buds, skeletonizing the leaves, and wrapping them into a bundle of cobwebs. Green brown head caterpillar *Exapate congelatella* Cl. also gnaws into the buds and leaves, thus, forming a lump. The

Fig. 11. *Aphis fabae* on young shoots of *Chaenomeles japonica.* Photo by A. Kuklina.

small wormhole, the crenellate lunate - *Ancylis selenana* Gn., common on Rosaceae fruit crops, was noted during the monitoring on *Ch. japonica* in the arboretum of the MBG RAS, and in the summer of 2016 it was noted in Prague (Czech Republic) at *Ch.* × *superba* (1-2 points). Greenish-yellow caterpillars (up to 1 cm long) skeletonize leaves, fold them in halves, along the central vein, and then gnaw them.

Gnawing phytophagous *Chaenomeles* includes the blue-headed scoop *Diloba coeruleocephala* L., syn. *Episema coeruleocephala* L. (Lepidoptera: Noctuidae) and alfalfa skosar - *Otiorrhynchus ligustici* L. (Coleoptera: Curculionidae), which feeds on buds and gnaws young leaves.

Fig. 12. *Chaenomeles* leaf, cigar-shaped swirling *Archips rosana.* Photo by A. Kuklina.

On the *Chaenomeles*, the beetle *Agriotes obscurus* L. (Coleoptera: Elateridae), usually preferring leaves of cereals, is found. Small beetle *Phyllobius urticae* Deg., syn. *Phyllobius pomaceus* Gyllenhal (Coleoptera: Curculionidae) is a polyphage found on the plants of Urticaceae and Rosaceae families.

Among phyllophages, *Nepticula malella* Stainton (syn. Stigmella malella Stt.), leaving serpentine mines extended in the middle, is marked; characteristic thin mines are typical of *Stigmella pomella* Vaugh. (Lepidoptera: Nepticulidae).

Chaenomeles fruits can be damaged by several carpophages characteristic of Rosaceae family. *Rhynchites bacchus* L. and *Coenorrhinus pauxillus* Germ are found everywhere (Coleoptera: Rhynchitidae), consuming young leaves and flowers of

Chaenomeles. The caterpillars *Laspeyresia pomonella* L., syn. *Carpocapsa pomonella* L. (Lepidoptera: Torticidae), gnawing ripe fruits, are occasionally observed.

Seed chambers in the fruits of *Ch. japonica* are destroyed by *Hoplocampa testudinea* Clug. (Hymenoptera: Tenthredinidae) frequently encountered on apple trees. European hornet - *Vespa crabro* L. (Hymenoptera: Vespidae) - usually feeds on flower nectar, fruit juice and pulp. Adult individuals eat the flesh of ripe *Chaenomeles* fruits (Fig. 13), and that accelerates their rotting.

Table 3. Occurrence of entomofauna representatives in the regions of central Russia.

Insecta orders	Moscow region	Tambov region
Homoptera	*Aphis fabae, A. pomi, Palomena prasina, Edwardsiana rosae*	*Aphis fabae*
Hemiptera	*Acanthosoma haemorrhoidalis*	*Acanthosoma haemorrhoidalis*
Hymenoptera	*Cladius pallipes, Hoplocampa testudinea, Vespa crabro*	
Lepidoptera	*Nepticula malella, Stigmella pomella Archips variegana, A. rosana, Laspeyresia pomonella, Exapate congelatella, Ancylis selenana, Diloba coeruleocephala*	*Acleris variegana, Exapate congelatella, Stigmella pomella*
Coleoptera	*Rhynchites bacchus, Coenorrhinus pauxillus, Phyllobius urticae, Agriotes obscurus*	*Rhynchites bacchus, Coenorrhinus pauxillus, Otiorrhynchus ligustici*

Fig. 13. Damage of *Vespa crabro* on the fruit of *Chaenomeles japonica*. Photo by A. Kuklina.

Conclusion

In central Russia, many years have been spent for the systematic monitoring of pathogens and phytophages on plants *Ch. japonica*, *Ch. cathayensis*, *Ch.* × *superba* and multipurpose cultivars. Among the identified pathogens, the most harmful pathogens are *Alternaria alternata*, *Septoria cydoniicola*, *Entomosporium eriobotryae*, *Phyllosticta cydoniae* var. *cydoniicola*, *Diplocarpon mespili*, *Gloeosporium cydoniae*, *Monilia cydoniae*, *M. fructigena*; less harmful are *Pestalotia breviseta* and *Phyllosticta velata*, *Penicillium expansum* and *P. cyclopium*. Filoplan mushrooms are widely spread. With age, the increase in the infectious background and the accumulation of damaging phytophages (*Botrytis cinerea*, *Phomopsis mali*, *Ph. perniciosa* and *Ph. ambigua*), including viral disease (ToRSV), is noted in plantings. *Cytospora cydoniae*, *Sphaeropsis cydoniae*, *Nectria cinnabarina* and

Neonectria galligena are marked on country-aged stands, causing the drying of branches and death of entire bushes. For a long period of observation of Disease outbreaks were not observed for a long period in the collections of *Chaenomeles*, and in general, all plants are in a satisfactory condition. As a result of the phytopathological monitoring, the following disease-resistant *Chaenomeles* cultivars were noticed: Albatros, Alyur, Voshod, Michurinsky Vitamin, Flagman and Sharm.

Chaenomeles plants have a complex of sucking, gnawing and mining phytophages. Among the representatives of the entomofauna prevalent chewing insects are: phyllophagous - *Archips variegana, A. rosana, Acleris variegana, Exapate congelatella, Cladius pallipes, Ancylis selenana, Diloba coeruleocephala, Agriotes obscurus, Phyllobius urticae, Otiorrhynchus ligustici* and karpovagous - *Rhynchites bacchus, Coenorrhinus pauxillus, Laspeyresia pomonella, Hoplocampa testudinea, Vespa crabro*. Sucking insects *(Palomena prasina, Edwardsiana rosae, Acanthosoma haemorrhoidalis*) are dangerous, especially *Aphis fabae* and *pomi*, which are carriers of phytoviruses. Phytophagous miners (*Nepticula malella* and *Stigmella pomella*) are few in number and have almost no effect on the decorativeness of bushes. Occasionally Snail-kamnetes *Helicigona lapicida* L. (Gastropoda: Helicidae), eating in dense plantings with leaves, less often with fruits, is occasionally found on *Ch. Japonica* plants.

Analysis of the phytophages composition shows that these are mainly autochthonous species, both polyphages and oligophages, preferring plants of Rosaceae family. Probably, this set is due to the close proximity of the experimental *Chaenomele*s plants with plantings of fruit crops of Rosaceae family, which facilitates the expansion of food links and favors the creation of new potentially dangerous "introduced species-pathogen" complexes.

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References

Chesnokova, N.I., Fedulova, Yu.A. & Skripnikova M.K. (2010). Features endophytic microbiota henomeles. *Fruit and Berry Russia, 24*(2), 139-144. (In Russian).

Fauna Europaea. (2022). Retrieved from fauna-eu.org.

Fedulova, Yu.A. (2009). *Economic and biological assessment of cultivars and forms of chamenomes in the conditions of the Central Black Earth region of Russia*. S.-H. sciences. Michurinsk, 22 p. (In Russian).

Fedulova, Yu.A. & Pimkin, M.Yu. (2016). Chaenomeles in Central Russia. Fruit growing and berry growing in Russia. *Sat. scientific works. T.* XXXXVII-M.: FGBNU VSTISP, pp. 347-351 (In Russian).

Fedulova, Yu.A., Kuklina, A.G. & Kashtanova, O.A. (2017). The study of pathogenic microflora and entomofauna on the cultivars of chaenomeles (*Chaenomeles* Lindl.) in the Tambov region. *Bulletin of Michurinsky State Agrarian University, 2*, 25-30. (In Russian).

Garkava, L.P., Rumpunen, K. & Bartish I.V. (2000). Genetic Relationships in *Chaenomeles* (Rosaceae) revealed by isozyme analysis. *Scientia Horticulturae, 85*(1-2), 21-35. doi: 10.1016/S0304-4238(99)00122-3.

Index Fungorum. (2022). Retrieved from indexfungorum.org.

Isaeva, E.V. & Shestopal, Z.A. (1991). Atlas of diseases of fruit and berry crops. Kiev: Harvest. 144 p. (In Ukrainian).

Khokhryakov, M.K. & Potlaychuk, V.I. (1984). *Determinant of crop diseases*. Leningrad, 304 p. (In Russian).

Komar-Dark, L.D. (2015). New breeding forms of henomeles. *New and non-traditional plants and prospects for their use*. *Odintsovo: VNIISSOK, 11*, 314-317. (In Russian).

Kuklina, A., Fedulova, Yu., Sorokopudov, V., Navalneva, I. (2016). Productivity and quality of Chaenomeles (*Chaenomeles* Lindl.) In Brindza J. & Klymenko S. (Eds.). *Middle Russia. Agrobiodiversity for Improving Nutrition*. Nitra, (pp. 214-217). Retrieved from ves.uniag.sk.

Kuklina, A.G. & Fedulova, Yu.A. (2015). Selection of new cultivars of Henomeles. *Fruit and berry growing in Russia. M.: FGBNU VSTISP, 41*, 200-202. (In Russian).

Kuklina, A.G. & Fedulova, Yu.A. (2017). Therapeutic and prophylactic value of food with the fruits of henomeles (*Chaenomeles* Lindl.). *Ways to improve the efficiency of gardening, 144*(2), 140-144. (In Russian).

Kuklina, A.G., Sorokopudov, V.N. & Navalneva, I.A. (2016). Integral assessment of the fruiting of selected forms of henomeles (*Chaenomeles* Lindl.) in Central Russia. *Proceedings of higher educational institutions. Volga region. Natural Sciences, 2*(14), 3-10. (In Russian).

Kuklina, A.G., Kashtanova, O.A. & Treivas, L.Yu. (2017). Entomo-phytopathological monitoring of species of the genus *Chaenomeles* Lindl. in the GBS RAS. *Bulletin of the Main Botanical Garden, 2*, 61-69. (In Russian).

Madachi, K. & Sahragard, A. (2012). Comparative life table of *Aphis pomi* (Hemiptera: Aphididae) on *Malus pumila* L. and *Chaenomeles japonica* under laboratory conditions. *Journal of Crop Protection, 1*(4), 321-330.

Mezhensky, V.N. (2004). *Henomeles.* Moscow - Donetsk, 62 p. (In Russian).

Mezhensky, V.N. (2010). Pomological value of ornamental cultivars of henomeles. *Modern gardening, 1*, 25-29. (In Russian).

Norin, I. & Rumpunen, K. (2002). Pathogens on Japanese Quince (*Phenomeles japonica*) Plants. In Rumpunen, K. (Ed.). *Japanese Quince - Potential Fruit Crop for Northern Europe*, (pp. 37-54), Alexandria: ASHS Press.

Rumpunen, K. (2002). Chaenomeles: Potential New Fruit Crop for Northern Europe. In Janic, I. & Whipkey, A. (Eds.). *Trends in new crops and new uses*. (pp. 385-392). Alexandria: ASHS Press.

Saveliev, N.N., Fedulova, Yu.A. & Skripnikova, M.K. (2009). Chaenomeles is a promising high-vitamin fruit culture. *Bulletin of the Russian Academy of Agricultural Sciences, 3*, 62-63. (In Russian).

Savkovsky, P.P. (1990). Atlas of pests of fruit and berry crops. Kiev: Harvest, 103 p. (In Ukrainian).

Treivas, L.Yu. & Kashtanova O.A. (2014). *Diseases and pests of fruit plants.* Moscow: Fiton XXI, 352 p. (In Russian).

Yu, L. & Bai, J.K. (1995). New species of *Phoma* and *Phyllosticta* from China. *Acta Mycologica Sinica, 14*, 192-195.

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