USE OF VIR POTATO COLLECTION'S GENETIC DIVERSITY AS INITIAL MATERIAL FOR BREEDING

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ABSTRACT. Use of VIR Potato collection's genetic diversity as initial material for breeding. *The Potato Collection of the N.I.Vavilov Institute of Plant Industry is one of the biggest in the world. It totals about 9000 accessions including 3000 accessions of wild and 3500 of cultivated species, 2100 of bred varieties, 400 of interspecific hybrids and dihaploids. Accessions of cultivated species, hybrid clones and bred varieties are preserved in vitro. The initial material with a complex of valuable traits including resistance to fungal, viral, bacterial diseases and pests has a special importance for modern breeding programs. The main source of genes that control resistance to diseases and pests are the wild and cultivated species. Complex evaluation of hundreds of samples is carried out annually at VIR and its experimental stations. As a result, valuable material for breeding has been selected. Crossability of wild potato species belonging to the series Acaulia Juz., Glabrescentia Buk., Commersoniana Buk., Demissa Buk., Longipedicellata Buk., Simpliciora Buk., Megistacroloba Card. et Hawk., Transaequatorialia Buk. (=Tuberosa wild Hawkes, =Bukasoviana Gorbat.) with species of other series and bred cultivars has been investigated.*

Keywords*: potato, collection, accession, traits, resistance, breeding*

Introduction

The collection of the N.I.Vavilov Institute is widely represented by diversity of *Solanum* genus, section *Petota*: about 170 wild and cultivated potato species, both Russian and foreign breeding cultivars.

One of the major directions of VIR activity – researches in prebreeding area, searching and creation of sources and donors of various valuable traits, including resistance to most dangerous pathogens. One of the purposes of our investigations is focused on research in pre-breeding area, as well as selection and creation of sources and donors of various valuable traits, including resistance to most dangerous pathogens.

The VIR potato collection was created 80 years ago due to initiative of N.I.Vavilov. Since a first stage of studying of potato diversity till nowadays potato germplasm is both an object for basic research and means used to achieve a pragmatic aim. In Russia an outstanding scientist A. Kameraz was a guide conducting potato hybridization to transmit useful genes from wild species to potato cultivars. As result numerous of genetic sources of valuable traits had been found and used in creation the complex potato hybrids (Kameraz *et al*., 1978, 1980). Those potato hybrids served new breeding cultivars generation. Today the scientists of institute continue search of new sources of valuable traits for breeding.

Now, in Russia about 90% of potato is grown in little farms and kitchen gardens, where the improvement of agricultural technology with elements of plants protection appears very difficult. In this situation, now the most important question is the creation of universal cultivars that would combine high yield, earliness, high table and processing qualities with high and stable resistance to the most harmful diseases and pests. The most harmful pathogens for potato grown in Russia are late blight (*Phytophthora infestans* (Mont) de Bary), rhizoctonia *Rizoctonia solanii* Kuhn., common scab *Streptomycies scabies*, potato viruses X, Y, S, M, golden potato cyst nematode *Globodera rostochiensis* Woll. and Colorado beetle *Leptinotarsa desimlineata* Say. Breeders require new genetic sources of resistance to these pathogens, and also sources of high yield, earliness and tuber quality. Therefore, the main goal of the investigations which have been carried out over the last 5 years (2002–2007) was to comprehensively study the VIR potato collection, and to find out the new genotypes with valuable commercial traits and high resistance to the above-mentioned pathogens.

Material and methods

The comprehensive evaluation of the samples from the potato collection was carried out in collaboration with researchers from the All-Russian Plant Protection Institute (RPPI) and was aimed at finding new genetic sources for breeding on resistance to the main potato pathogens. The samples for screening were selected after a preliminary three-year visual evaluation. Laboratory and field screening on resistance to fungal, viral diseases and golden potato cyst nematode was carried out using methods developed by the VIR (Guidelines on methods, 1986), RPPI and All-Russian Potato Research Institute. Late blight resistance was evaluated both in field and laboratory conditions using artificial infection by a mix of the most aggressive races of *Phytophtora infestans* on 9 point's scale. Infection was done two times by using high concentrated suspension: up to 30 conidia in a field of sight of microscope at 120 aliquot increase. Infection was conducted both on plants-seedlings in a phase of 5–6 leaf and leaf of adult plants. For artificial infection 250 seedlings of each accession was used. The evaluation of resistance to *G. rostochiensis* was carried out by a method of growing of plants in pots with soil, infected by larvas of a nematode. In each pot were imported 500 cysts with viable larvas. As resistant are considered the plants, which after 2 months of growing have not on the roots any viable cysts.

In total 1640 accessions of the potato collection were screened. The evaluation of commercial traits of breeding cultivars, hybrids and cultivated species was carried out simultaneously in five VIR's experimental stations in various geographical regions: St.-Petersburg, Murmansk, Tambov and Krasnodar.

A resistance to common scab, silver scurf and rhizoctonia was made in after winter storage using the method of All Russian Potato Research Institute (Guidelines, 1980) and modified by Nazarova (1986).

Results and discussion

Evaluation accessions of potato collection for valuable breeding traits

Breeding varieties The comprehensive evaluation of the collection for such commercial traits as yield, earliness, starch content, made it possible to identify valuable initial material for breeding.

Yield. The yield evaluation of breeding cultivars identified both Russian and foreign varieties which ones within 3–5 years exceeded the standard varieties by 60–80%. The following varieties showed the highest yield (compared to standard, Nevsky and Petersburgsky), Akrosia, Antonina, Avrora, Bouquet, Debryansk, Elizaveta, Elyseyevsky, Ladozhsky, Lakomka, Lazar', Malinovka, Russkii souvenir, Sparta, Kholmogorsky, Effect, Youbiley Zhukova, Vdokhnovenie, Zhigulyovsky, (Russia); Blakit, Zhouravinka, Zarnitsa, Zdabytak, Lazourit, Lileja, Odissey, Talisman, Yavor (Byelorussia); Baszta, Bzura, Koga, Triada, Tristar, PS–17036 (Poland); Alwara, Ivetta, Velox (Germany); Koreta, Korneta (Czech Republic). Varieties Udacha and, Lazurite were equally high and stable in terms of years in different geographical conditions and were considered plastic on yield, earliness and table qualities.

Number of tubers – is one of the components of potato yield. The richest sources of this trait are South American cultivated species *S. andigenum, S. rybinii, S. goniocalyx* and *S. stenotomum*. The wide polymorphism characteristic of these species has made it possible to identify the new sources of high number of tubers, namely *S. andigenum* k–8194, k–4629, S. *rybinii*, k–7160, k–8592, k–8596, *S. goniocalyx* k–6507, k–7048, k–8069, k–8162, k–17961, *S. stenotomum* k–12782, k–10915, k–13257, k–13250, k–10433. The average number of tuber per one plant in these samples is between 25 and 40.

Earliness. Creation of early varieties is an important breeding objective, especially for North and Northwest regions of Russia. Over the last years, the potato collection has been augmented with new early varieties, many of which combine earliness with other valuable traits. After three years of studying the new varieties, the following have been considered to be the best early varieties: Alyona, Bezhitskii, Bryanskii delicatess, Daryonka, Debryansk, Zhavoronok, Zhukovskii rannii, Lakomka, Lina, Ljubava, Pogarsky, Russkii souvenir, Snegir', Udacha, Kholmogorsky, Effect (Russia), Yavor (Byelorussia), Aster, Bekas, Irga, Harpun, Lena (Poland), Andra, Bonus, Velox (Germany); Kobra, Korela, Korneta, Krasa, Tegal (Czech Republic) etc. Most of them exceeded the standard for this parameter by 20–40%.

High starch content. Byelorussian varieties are a valuable source for breeding on high starch content. It was confirmed by the results of an evaluation on progeny from self-pollination of the varieties that had shown a high degree of inheritance of this trait (60–80% of seedlings). The following cultivars can also be recommended as high-starch varieties: Alaya zarya; Bryanskii nadjozhnyi, Bryanskaya novinka, Golubizna, Lakomka, Lazar', Master, Nakra, Slava Bryanschiny (Russia); Alpinist, Atlant, Garant, Zdabytak, Zoubryonok, Lazurit, Milavitsa, Synthez (Byelorussia), Zarevo (Ukraine), Teniz, Karasayskii, Asaja, Assia (Germany), Agria, Kardal, Karida, Karnico, Vebeca (Netherlands), Ceza (Poland).

Resistance to late blight (Phytophtora infestns (Mont.) de Bary). This disease is still one of the most harmful and common disease for potato grown in Russia. Therefore, the problem of creating varieties resistant to late blight is one of the most important tasks on potato breeding. Wild species of the *Solanum* genus are the main source for breeding late blight-resistant cultivars. The studies of their wide diversity in potato collections make it possible to find new sources of high resistance, both hypersensitive type and broad-spectrum (horizontal) type.

Therefore, apart from the species that have already been discovered, namely *S. berthaulti, S. bulbocastanum, S. demissum, S. fendlerii, S. medians, S. microdontum, S. michoacanum, S. pinnatisectum, S. polyadenium* and *S.polytrichon,* which have a lot of resistant genotypes, we found genotypes, which had not been identified before as possessing resistant forms: *S. albicans* k–9813, *S. cardiophyllum* k–16828, k–17380, *S. doddsii* k–20705, k–20709, ***S.** hougasii* k–10515, k–12165, k–18886, *S. okadae* k–20175. It needs to be mentioned that the following samples can be characterized as being highly late blight-resistant: *S. cardiophylum* k–16828, k–10456 and *S. ocadae* k–20177.

Five years of studies have shown that the following species are highly resistant to late blight: *S. albornzii* k–17621*, S. avilesii* k–20410*, S. berthaultii* k–7637, k–8787, k–23047*, S. brachycarpum* k–21258*, S. capsicibaccatum* k–15155, *S. immite* k–12168, k–16564, k–18109*, S. microdontum* k–19136*, S. ruizceballosii* k–7370, *S. simplicifolium* k–5399*, S. vernei* k–18158, *k–18161,* k–20125 and North-American species: *S. demissum k–23306, k–2332, S. bulbocastanum* k–21275, k–21278, k–22677, k–22998*, S. hougasii* k–18886*, S.iopetalum* k–1052, *S. papita* k–

S. papita k–16888, k–17454, k–21547, k–22592, *S. pinnatisectum* k–19758, k–15252, k–15253, *S. polyadenium* k–15256, k–18139, k–19330, *S. polytrichon k–18925, S. stoloniferum* k–19200, k–19201, *S. verrucosum* k–22609. Accessions *S. berthaultii* k–23047, *S. cardiophyllum* k–16828, *S. neoantipovichii* k–8505, *S. ruiz-ceballosii* k–7370 combine foliage and tuber resistance to late blight.

It is important to emphasize the high value of accessions of wild species that are resistant to several pathogens. Accession of *S. pinnatisectum* k–15253 combines resistance to late blight, three strains of PVY, Colorado beetle and potato tuber moth.

An evaluation of breeding varieties identified accessions with high field resistance to late blight (7–8 points). These are Aspiya, Avrora, Bryansky krasnyi, Charodey, Loukyanovskii, Nikulinskii, Udacha, Vestnik, Zhigulyovskii (Russia); Lasunak, Souzor'e Zdabytak, (Byelorussia); Lybid', Lugovskoy, Zarevo, (Ukraine); Ania, Baszta, Dunajec, Grot, Jantar, Klepa, Koga, Lawina, Meduza, Omulev, Triada, (Poland), Clarissa (Germany); hybrid clones from USA LBR–1, LBR–7, LBR–18, LBR–46, LBR–47.

Resistance to other fungal diseases. The screening of more than 430 accessions of wild and cultivated species on resistance to common scab (*Streptomyces scabies* (Thaxt) Waksman), rhizoctonia *Rhizoctonia solani* Kühn and silver scurf (*Spondylocladium atrovirens* Harz) was carried out in cooperation with researchers from Petrozavodsk State University. As a result of screening in natural and artificial conditions a high level of resistance to *Rhizoctonia solani* Kühn was detected among the species related to *Longipedicellata* (*S. fendleri; S. hjertingii S. polytrichon*), *Pinnatisecta* (*S. jamesii, S. pinnatisectum, S. michoacanum), Cardiophyla (S. cardiophylum)* and *Bulbocastana* series (*S. bulbocastanum*). Among accessions of cultivated species, resistant genotypes to this disease within *S.andigenum, S. goniocalyx, S. phureja, S. stenotomum, S. rybinii* were singled out.

The most resistant accessions to rhizoctonia as *S. chacoense* k–21321, *S. kurtzianum* k–20038, *S.fendlerii* k–20011, *S. oplocense* k–19145, S. polytrichon k–20087, *S.andigenum* k–4709, k–4713, k–4716, *S.rybinii* k–3375, k–9087, k–9276, k–16534, k–1815 were identified. Sources of resistance to common scab as accessions *S. boliviense* k–18766, *S. cardiophylum* k–21835, *S. hondelmanii* k–20773, *S. jamesii* k–9155, *S. andigenum*: k–11856 were revealed. Seven accessions of *S. goniocalyx, S. stenotomum* and *S. rybinii* were determined as resistant to silver scurf.

*Resistance to potato viral diseases***.** Studies on accessions from the VIR potato collection conducted in cooperation with the All-Russian Plant Protection Institute and Institute of Plant Acclimatization and Breeding (IHAR, Mlohov, Poland) over the past few years made it possible to find new genetic sources of resistance to PVY and PVX.

High resistance to PVX was shown by accessions of samples *S. acaule* k–10678, k–10679, k–18002, k–18007, k–18021, *S.bulbocastanum* k–23167, k–24200, *S. microdontum* k–23434, *S. chacoense* k–23232, *S. demissum* k–23321, *S. fendlerii* k–12158, k–23841, *S. cardiophylum* k–21954, k–23278, k–24203, k–24375, *S. jamesii* k–21456. The accessions of *S. acaule* k–9794, *S. berthaultii* k–23047, *S. demissum* k–3345, k–3362, k–3540, *S. polytrichon*, k–5347, k–5682, *S. pinnatisectum* k–4459 and *S. guerreroense* k–18407 combine resistance to PVX and late blight. The latter showed resistance to all three strains of PVY.

The screening on resistance to PVY made it possible to identify highly resistant accessions of *S.chacoense* k–3678, k–4236, *S. demissum* k–3362, k–3540, *S. dolychostigma* k–7610, k–7613, *S. guerreroense* k–18407, *S. michoacanum* k–5763, S. *neoantipovitczii* k–8505, *S. pinnatisectum* k–4455, k–4459, k–19157, *S. stoloniferum*, k–3533, k–3554, k–4226, *S. polytrichon* k–5682. Resistance to three strains of PVY was revealed in the samples of wild species *S. stoloniferum* k–5682, *S.neoantipovichii* k–8505, *S.chacoense* k–4236, *S.dolichostigma* k–7610, *S. pinnatisectum* k–4459, *S. polytrichon* k–5347, k–5682.

Many of the accessions identified as being resistant to viruses combine this trait with resistance to other pathogens. Accession k–7610 of *S. dolichostigma* was shown to be resistant to PVY and highly resistant to Colorado beetle. Resistance to PVY and late blight was shown by accessions of *S. stoloniferum* k–2534, k–3326, k–3527, *S. neoantipovichii* k–8505, *S. pinnatisectum* k–4459 and *S. polytrichon* k–5347. Accession *S. stoloniferum* k–3326 combines high resistance to late blight with resistance to PVY and partial resistance to PVX (Zoteyeva, 2004)

Resistance to golden potato cyst nematode (*G.rostochiensis* Woll.) remains a priority objective for Russian potato breeding in the nearest years. According to L. Kostina et al. (2007), now world total number of breeding cultivars resistant to *G. rostochiensis* is more than 600. For example, 240 resistant cultivars have been created in Germany, more than 180 in the Netherlands, 40 in Poland, 24 in England, 40 in Byelorussia, 19 in Russia, 5 in Lithuania, 4 in Ukraine, etc. In 2006, the State Register List of the Russian Federation included only 14 Russian varieties. Control of potato cyst nematode distribution in Russia is an important problem for quarantine inspection. In Russia, the patotype Ro_1 of *G. rostochiensis* is common. Thus, the breeding of new cultivars that have resistance to *G. rostochiensis* Ro_1 is a topical question. A number of samples of *S. andigenum* Juz. et Buk. which possessed resistance to this pathogen have been identified among accessions at VIR potato genebank (Kiru *et al*., 2005) it is quite probable that eventually they will spread to Russia (Ro_2, Ro_3, Ro_4, Ro_5). Therefore, Russian breeders should work not only on resistance to Ro_1 patotype, but start to use in breeding an initial material possessing resistance to various patotypes of *G. rostochiensis* and other species – *G. pallida* (Pa_1, Pa_2, Pa_3). It is recommended to use as initial material those varieties which provide for sexual progeny not only genes of resistance to few patotypes, but also such commercial traits as high yield, earliness, high content of dry matter, table qualities, etc. As example the following varieties could be named: 1) resistant to patotypes $Ro_{1,2,3}$ – Allure, Amalfy, Belita, Cordia, Liseta, Mara, Platina, Producent, Red Scarlett, Vebeca, Veenster; (2) – resistant to $Ro_{1,2,3,4}$ – Amera, Elkana; (3) – resistant to $Ro_{1,3,5}$ – Roeslau; (4) to $Ro_{1,4,5}$ – Esta; (5) resistant to $Ro_{1,5}$ – Lyra, Wega; (6) resistant to $Ro_{1,2,3,5}$ – Fox, Hilta, Ute; (7) resistant to $Ro_{1–5}$ – Aiko, Arnika, Franzi, Miranda, Ponto; (8) resistant to $Ro_{1,2,4,5}$ – Turbo etc. Varieties resistant to two species of nematode *G. rostochiensis* and *G. pallida* have particular significance in terms of breeding: Ro_1, Pa_2 – Maritima, Ramos; Ro_1, Pa_3 – Drop; Ro_1, $Pa_{1,3}$ – Vantage; $Ro_{1,5}$, Pa_2 – Heidrun; $Ro_{1,2,5}$, Pa_2 – Benol; $Ro_{1,3,4}$, Pa_2 – Danva; $Ro_{1–3}$, Pa_2 – Karida, Karnico, Pansta; $Ro_{1–3}$, $Pa_{2,3}$ – Kantara; $Ro_{1–4}$, Pa_2 – Atrela, Elles, Producent, Promesse, Sante; $Ro_{1,2,3,5}$, Pa_2 – Tanja; $Ro_{1–5}$, Pa_2 – Darwina, Proton. These varieties are also valuable because they combine resistance to PCN with others valuable traits (high yield, resistance to viral diseases or late blight). Evaluation of their progeny from self-pollination made it possible to identify a high share of resistant seedlings in a segregating population. PCN-resistant seedlings of cultivars Alcmaria, Granola, Provita, Quarta, Sagitta and hybrid clone SVP (VTN) 2 62–33–3 account to more than 60 %. Varieties Agria, Amigo, Berber, Elcana, Panda, Ukama, Van Gog (Netherlands), Drop, Grot, Koga, Lawina (Poland), Juliver (Germany) also showed a high degree of inheritance of resistant cultivars.

VIR potato genetic collection includes all new sources and donors of the valuable traits, singled out after three-year screening of germplasm (Table 1). The genetic collection includes those genotypes, which posses by genes controlling valuable traits and a high degree of inheritance of them in sexual progeny.

Studies of crossability of wild and cultivated potato species

One of the basic characteristics directly determining the suitability of wild species for breeding is their crossability with a common potato. Currently, the Department of Potato Genetic Resources is focusing on studying the crossability of wild potato species and interspecific hybrids created recently. Some of them have been used as an initial material for creating new potato varieties in Russia, Byelorussia and Kazakhstan.

Increased harmfulness of common potato pathogens and threats from previously insignificant potato pathogens dictate the need to constantly expand the germplasm and search new sources of resistance to extreme environmental factors. In 2004–2007 *Solanum* species from South America that were described by K. Ochoa and previously had not been sufficiently studied or used in breeding purpose were put in test for the first time by researchers from the N.I.Vavilov Institute. These are species belonging to series *Tuberosa* Rydb. (Hawkes) or *Bukasoviana* Gorbat. The first generation of hybrids from crossing species *S. alandiae*, *S. doddsii, S. gandarillasii* with a common potato has been obtained. A number of potentially important hybrid clones (Rogozina, 2005) have been selected. Studies of inheritance of resistance to late blight and PCN by offspring of several clones are now being carried out.

Inheritance of resistance to late blight

Due to changes in the populations of *Phytophtora infestans* high level horizontal resistance effective against all races of this pathogen is the only reliable mechanism capable to protecting potato from late blight. The polygenic nature of horizontal resistance provides the opportunity to combine resistance of different Solanum species.

in one genotype. The complex interspecific hybrids with horizontal resistance to late blight scored of 8–9 during many years reproduction even at the blight epidemics were generated (Rogozina, 2003). Analyses of inheritance level indicate that the hybrids are able to transmit this resistance to a high proportion of its progeny (60–80% of seedlings). These resistant hybrids were created using highly efficient sources, alternating crosses with the obtaining of self pollinated progeny of the unsusceptible hybrids, continuous selection for horizontal resistance trough series of hybrid generations and convergent crosses between the hybrids inheriting resistance from different wild potato species (Rogozina, Kiru 2005). The crosses with breeding varieties and subsequent backcrosses with resistant hybrids resulted in the identification of high horizontal resistance of wild species *S. simplicifolium, S. polytrichon, S. verrucosum* – up to 80% of seedlings remained disease-free after artificial inoculation and most manifested high field resistance to late blight, rating 8–9 (Kolobayev, 2001). It is well known that such species as *S. pinnatisectum, S. bulbocastanum, S. berthaultii, S. stoloniferum, S. microdontum* and *Solanum tuberosum* L. subsp. *andigena* are rich sources of genotypes possessing by *R*-genes of resistance to *P. infestans*. The results of many-year investigations showed that *Solanum* species diversity when used in crosses reinforces the expression of horizontal late blight resistance in potato. For instance, hybrids combining resistance genes inherited from five potato species could be infected by *P. infestans* only five as much concentration inoculum (Kolobaev, Rogozina, 2007). Further progress in potato breeding on horizontal resistance o late blight will be facilitated be the wider user of *Solanum* genetic diversity.

The most attractive for researchers and breeders are North-American species, which posses both hypersensitive and horizontal types of resistance to late blight.

Table 1. The fragment of VIR Potato Genetic Resources Database. Sources of valuable traits among recently studied potato species.

Species	VIR catalog numb.	Country of origin	Valuable traits for breeding
S. abancayense	k–18064	Bolivia	Resistance to root-knote nematode, Colorado beetle and late blight
S. alandiae	k–21240	Bolivia	Resistance to Colorado beetle
S. ambosinum	k–20883	Peru	Resistance to Colorado beetle and late blight
S. acroscopicum	k–23871	Peru	Resistance to root-knote nematode; low content of glykoalcaloids
S. avilesii	k–20884	Bolivia	Resistance to root-knote nematode, Colorado beetle and late blight
S. doddsii	k–20704	Bolivia	Resistance to late blight
S. famatinae	k–23600	Argentina	Resistance to *G. rostochiensis* Woll. Ro_1 and frost; high starch content (21–24%)
S. fendlerii	k–18489	Mexico	Resistance to late blight (r, $R_1R_2R_3R_4$), rhizoctonia, *G. rostochiensis* Woll. Ro_1, PVX and PVY; High starch content (24–28%) and protein (3–4%)
S. gandarillasii	k–20698	Bolivia	Resistance to PVM and drought; high processing quality
S. hiertingii	k–19094	Mexico	Resistance to late blight r, R_x, rhizoctonia and *G. rostochiensis* Woll. Ro1; high starch content (22–28%) and protein (3.2%)
S. hondelmannii	k–21410	Bolivia	Resistance to ring rot and black leg
S. jamesii	k–8480	Mexico	Resistance to wart, late blight, *G. rostochiensis* Woll. Ro_1, *Ditilenchus distr*.and Colorado beetle; high starch cont. (up to 30%) and protein (3.5%)
S. pinnatisectum	k–19158	Mexico	Resistance to wart, late blight rhizoctonia, *G. rostochiensis* Woll. Ro_1, PVY, PLRV and Colorado betle; high starch cont (up to 35%) and protein (up to 4.3%)
S acroscopicum	k–23871	Peru	Resistance to Colorado betle and root-knote nematode; low content of glykoalcaloids
S. ambosinum	k–20883	Peru	Resistance to late blight, Colorado beetle and root-knote nematode
S. famatinae	k–23060	Argentina	Resistance to *G. rostochiensis* Woll. Ro_1, silver scurf and frost; high starch cont (up to 24%)

Conclusions

The potato collection of the N. Vavilov Institute is the basic source of initial material for all breeding purposes. Due to the rich diversity of wild and cultivated species made achievable by modern technologies, it is now possible to involve useful traits in breeding in relatively short periods of time. Comprehensive evaluation of collection accessions makes it possible to identify and create a highly effective initial material for the creation of new cultivars having a complex of valuable properties, including high and stable resistance to the main pathogens. By using the new *Solanum* species in hybridization, initial breeding material can be created.

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