Poplar testing and breeding in the Central Chernozem region of Russia

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Abstract. Poplar – Populus L. is a widely-distributed major forestry species in the north hemisphere. Here we investigated poplars selected in the local forests, introduced from different regions, and hybrids during the last 60 years. More than 300 clones and varieties were introduced from 30 locations of the former USSR and more than 4,000 new poplar hybrids were bred in the Voronezh region and maintained in the field collections and field tests of the Central Chernozem region. Based on the variety testing, we selected the most promising clones and varieties as well as developed the assortment for different target forest plantations. Also, the tested varieties were patented by the Federal Registration including the black and white poplars: ‘Steppe Lada’, ‘Breeze’, ‘Surprise’, ‘Bolide’, ‘Veduga’. We developed a new series of hybrids with P. tremula by collaborating with the Germany Ministry of Food and Agriculture. In these series the factorial crossings included the hybrids between the heart rot stable and fast-growing parental forms with unstable to decay parents. Our study will build the way of developing the heart rot stable genotypes of aspen based on the genetic architecture. Our varieties will strengthen the local timber supply and the reclamation of the disturbed lands as well as to replenish the assortments for landscaping in the region and other territories.

1. Introduction

Woody plants are of important economic, ecological and social values in the world. In the United States – Sequoia and Sequoiadendron, in Japan – Prunus serrulata and Cryptomeria, in Germany – Fagus and Picea, in South Africa – Acacia. Every country owns the most common and popular species of woody plants. In Russia – there are Larix, Pinus, Picea, Betula etc. In the Central Chernozem Region – Pinus and Quercus. Poplar – Populus L. is only one of tree species which is cultivated in dozens of other countries such as the USA and Canada, Italy and France, Holland and Germany, China and India, and so on [1-6].

The Russian poplar – P. tremula L. – was often studied by a number of Russian scientists [7-9]. In the twentieth century, in addition to aspen, a large scale study of other poplar species was undertaken, especially since 1930, when a new network of educational and scientific forestry institutes were organized in the country. These researchers are widely known, i.e., V. L. Komarov, A. V. Al’bensky, P. P. Besschetnov, P. L. Bogdanov, A. S. Yablokov, G. P. Ozolin, S. P. Ivannikov, N. V. Starova and others. These and other researchers studied and described the species composition of Russia’s poplars,
had been carrying out their breeding by selection and hybridization methods, had been laying field experimental objects for variety testing, had been developing the methods of reproduction and cultivation.

Professor M. M. Veresin was the pioneer of such works with poplar in the Central Chernozem Region. He collected the best clones and varieties from other scientists, bred his own hybrids and had created educational and research collections of the introduced and his own hybrids. His works have been continuing by his pupils and followers.

The purpose of this work is endeavour to light the main stages of poplar breeding which are carried out by M. M. Veresin and also by his pupils and followers during the second half of XX and the beginning of the XXI century and to present some practical results of this work which can be used in forestry, shelter belt, landscape gardening and timber processing industries.

2. Methods and Materials

We selected clones from the natural and artificial local plantation, received materials from other regions of the country and abroad, obtained hybrids, reproduced, tested in the field experiments, and analyzed their growth.

Seven experiment sites (six collection sites in Voronezh region at the total area about 5,000 m² and one test site in the Khoper reserve, 1.5 hectares) were created, operated and managed by M. M. Veresin. The variety testing site in Novo-Ussman’ Forestry in the Voronezh Region employed technique of All-Union Research Institute of Silviculture and Forestry Mechanization [10] at the area of 4 hectares had been created. The age of collections and variety tested materials ranged from 4 to 20 years.

M. M. Veresin selected and bred 52 clones from the different poplar species and hybrids in local nature plantation, or received by him from the Russian forest breeders (A. V. Al’bensky, A. S. Yablokov, P. L. Bogdanov etc.) had been collected [11, 12]. The productivity of these poplar clones, stability to damage by frosts, pests and phytodiseases were studied in the created collections. Since 1971, these works had been continuing in the institution “Central Research Institute of Forest Genetics and Tree Breeding’’.

For operating time in the Central Research Institute of Forest Genetics and Breeding by scientific group engaged in poplar breeding the collection from 300 forms, clones and cultivars received from more than 30 places was created. The most significant quantities of samples had been received from the Astrakhan’ Forest Research Station of the All-Union Research Institute of Silviculture and Forestry Mechanization, the Voronezh Forest Technical Institute, Ukrainian Research Institute of Forestry and Agro-Forest Reclamations, the Middle Asian Research Institute of Forestry, the Oboyan Forestry in the Kursk Region, the Dwina Forest Research Station, the Forest-steppe Research Seed-growing Station, the Leningrad Forest Technical Academy, the Kazakh Agricultural Institute, the Tsyrupinsk Forest Research Station, the Amur Forest Research Station, the L’voi Purchasing Forestry and other research scientific institutions and forest manufacturing enterprises of the former Soviet Union. The received material had been multiplied in collecting shoot cutting plantation at the area of 1.5 hectares where primary variety testing had been carrying out. Then poplars had been tested in the Semiluki populetum (80 clones), in the Semiluki clones collection (100 clones) and also in experience-industrial plantation in the Central Chernozem Region: in Voronezh region (6 sites), in Lipetsks region (3 sites), in Tambov region (1 site) and also in Volgograd region (3 sites), in Astrakhan’ region (2 sites) and in Donetsk region in Ukraine (2 sites). Besides, new annual shoot cutting plantations in the different forestry enterprises had been created.

In addition to the poplar and aspen hybrids either earlier bred by M. M. Veresin in the Central Chernozem Region, or introduced from other regions, in the Central Research Institute of Forest Genetics and Breeding had undertaken experiments on use of hybridization for receiving new poplar genotypes. Hybridization was made on the branch cuttings of the scion donor trees. Branches had been prepared on adult trees by means of climbers. For crosses the winter-hardiness and fast-growing maternal trees which are selected in earlier collections, in forest and greening plantings were selected.
The selected male parent trees had to differ in any morphological or other important economic or biological features.

Totally 736 crossing variants had been carried out, dozens of thousands of hybrid shoots had been received and after rejection 44 150 hybrid seedlings had been grown up [13]. After rejection and preliminary selection the received hybrid seedlings were arranged for field testing in 4 collections:

1) The Semiluki collection of poplar hybrids No. 1 (created in 1977-1980 from 810 hybrid seedlings from 23 combinations of crossings – the author A. P. Tsarev);

2) The Semiluki collection of aspen hybrids (created in 1982 from 1 093 seedlings obtained from 9 hybrid families – the author V. P. Petrukhnov);

3) The Semiluki collection of poplar hybrids No. 2 (created in 1984 from 420 hybrid seedlings obtained from 26 crossing combinations – the author R. P. Tsareva);

4) The Davydovka collection of poplar hybrids (created in 1990 from 590 hybrid seedlings obtained from 26 crossing combinations – the author R. P. Tsareva).

More detailed characteristics of these collections have been given earlier [13]. These collections had been used for field testing of the received hybrids and selecting from them the best new poplar varieties for breeding and also for researching of genetic and breeding properties of the testing plants.

During last three years in the All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology (former the Central Research Institute of Forest Genetics and Breeding) in the hybridization works with aspen factorial crossings have been used. 880 sib and 1,200 half sib hybrid shoots had been received then 647 and 762 1-year seedlings respectively were grown up. After preliminary selection about a half of them were planted on the constant place. Constant field testing sites had been created under two different soil conditions: one – in the Typical Chernozem soil with complete plowing on an old arable long fallow land and another – with partial plowing in the furrows cut in the Gray Forest sandy loam soil after the clear cuttings. The first site includes 3 repetitions, the second one – 5. The arrangement of the hybrid families is randomized.

The investigations, observations, experiment creations had been carried out with the verified and well-known methodical guides [10, 14, 15, 16] and also with number of the references [1, 2, 4, 17 etc]. In the annual field observations, measurements, and their analyses the standard mathematic-statistical methods [18] and possibilities of the computer Excel program were used.

3. Results and discussion

**The results of poplar breeding works undertaken by M. M. Veresin.** The objects created by M. M. Veresin and his colleagues and pupils have been surveyed by us in 1971-1973 [12]. As a result 14 genotypes from 52 tested had been allocated for cultivating in the Central Chernozem Region. For massive and shelter belt forest plantations under the floodplain conditions those poplars as ‘Pioneer’, ‘E.s.-38’ (called subsequently its author M. M. Veresin as ‘Voronezh Giant’), P. ‘rubrinervis’ Alb., etc. had been recommended; under the high watershed conditions with deep groundwater horizon for the massive (for timber logging operations) forest plantations – P. alba L., M. M. Veresin’s poplar hybrid P. alba L. × P. tremula L., ‘Pioneer’, P. ‘rubrinervis’ Alb. and for shelter belt forest plantations – poplars ‘Bolle Kamyshinsky’ and ‘Pyramidal'ny-osokorevy Kamyshinsky’ had been recommended. In the greenery landscaping either under the floodplain conditions, or under the high watershed conditions only such male poplar clones and hybrids had been recommended as ‘Bolle Kamyshinsky’, ‘Pyramidal-Ösokorevy Kamyshinsky’, ‘Russky’, ‘Voronezh Giant’, ‘Podmoskovny’, ‘Ivanteevsky’, hybrid P. alba L. × P. tremula L. and ‘Sovetsky Pyramidal'ny’. Also some other prospective poplar cultivars had been allocated.

**Continuation of poplar breeding works in the Central Research Institute of Forest Genetics and Breeding.** Fast-growing tree plantation is widely researched around world [4, 6, 19, 20, 21, 22]. All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology receives offers from the commercial enterprises to take part in creation of such plantations. At the same time customers would
liketo receive commodity wood in 12 years. If the aim of massive forest cultivation is to receive large
saw logging timber products but under the majority of our conditions, much longer turnover of the
planting is necessary. Our studies in the Semiluki populetum (the soil – the Typical Chernozem, type
of growth conditions – $D_2$, arrangement place of plants $5 \times 4$ m) have shown that wood stock at 16-year
age in some best selected poplar clones and varieties can fluctuate from 183 m$^3$/hectare (P. ‘Pioneer’) up to 495 m$^3$/hectare (P. ‘Regenerata-78’). At the same time the wood stock of the control P. nigra L.
was only 111 m$^3$/hectare (table 1).

Table 1. Productivity indices of the prospective poplar varieties and clones for the Central Chernozem
Region (age of 16, arrangement place $5 \times 4$ m).

| The name of the hybrid | Reg. No | Survival, % | Height, m $\pm m$ | Diameter, cm $\pm m$ | Volume of the trunk, m$^3$ $\pm m$ | Wood stock $\bar{W}$, m$^3$/ha |
|------------------------|---------|-------------|------------------|------------------|-----------------------------|--------------------------|
| ‘Pioneer’              | 42      | 63.0        | 22.4 $\pm 0.68$  | 29.1 $\pm 1.65$  | 0.581 $\pm 0.077$            | 183                      |
| ‘Brabantica-175’       | 158     | 63.0        | 23.9 $\pm 0.83$  | 33.5 $\pm 0.98$  | 0.822 $\pm 0.076$            | 259                      |
| ‘Vernirubens’          | 54      | 92.0        | 24.0 $\pm 0.63$  | 31.4 $\pm 1.54$  | 0.725 $\pm 0.091$            | 333                      |
| ‘Gelrica’              | 80      | 88.0        | 23.2 $\pm 0.41$  | 34.0 $\pm 1.39$  | 0.821 $\pm 0.079$            | 361                      |
| ‘Marilandica-239’      | 34      | 92.0        | 21.6 $\pm 0.46$  | 32.3 $\pm 1.07$  | 0.690 $\pm 0.052$            | 318                      |
| ‘Regenerata’           | 78      | 92.0        | 24.6 $\pm 0.51$  | 37.8 $\pm 1.10$  | 1.077 $\pm 0.075$            | 495                      |
| ‘Regenerata’           | 79      | 71.0        | 24.0 $\pm 0.51$  | 38.3 $\pm 0.88$  | 1.078 $\pm 0.067$            | 383                      |
| ‘Robusta-236’          | 156     | 92.0        | 23.5 $\pm 0.43$  | 29.3 $\pm 0.89$  | 0.618 $\pm 0.064$            | 284                      |
| P. trihocharpa Torr. et Gray | 83 | 100.0       | 22.4 $\pm 0.28$  | 27.4 $\pm 0.69$  | 0.515 $\pm 0.027$            | 258                      |
| P. simonii Carr.       | 133     | 96.0        | 21.8 $\pm 0.37$  | 26.9 $\pm 0.97$  | 0.483 $\pm 0.036$            | 232                      |
| ‘E.s.-38’              | 94      | 100.0       | 22.4 $\pm 0.22$  | 30.3 $\pm 0.67$  | 0.630 $\pm 0.029$            | 315                      |
| P. berolinensis Dipp.  | 130     | 88.0        | 23.6 $\pm 0.31$  | 29.2 $\pm 0.61$  | 0.616 $\pm 0.031$            | 271                      |
| ‘Hybrid No. 10’        | 106     | 83.0        | 21.8 $\pm 0.36$  | 32.1 $\pm 1.26$  | 0.688 $\pm 0.055$            | 286                      |
| ‘Hybrid No. 300’       | 49      | 100.0       | 22.7 $\pm 0.28$  | 27.6 $\pm 0.48$  | 0.530 $\pm 0.020$            | 265                      |
| P. nigra L. (control)  | 131     | 54.0        | 20.6 $\pm 1.01$  | 25.5 $\pm 1.81$  | 0.410 $\pm 0.067$            | 111                      |

However, at this age and for this arrangement place plants did not reach the age of quantitative
timber maturity yet and continued to increase a wood stock intensively. At the same time, the average
increment of the same varieties at this age fluctuated from 11.4 to 31.0 m$^3$/hectare per year when the
control’s average increment was only 6.9 m$^3$/hectare per year. According to our data, the quantitative
timber maturity of plants for different morphology-systematic groups comes generally only in 26-28
years. Our research of poplar growth in the populetum at 25-year age have shown that a wood stock of
the same varieties varied from 410 m$^3$/ha (P. ‘Pioneer’) to 1 151 m$^3$/ha (P. ‘Regenerata-78’) [22]. I.e.
with the current increment for 9 years from 25 m$^3$/ha per year (P. ‘Pioneer’) to 73 m$^3$/ha per year
(P. ‘Regenerata-78’) the wood stock of the same varieties in these 9 years had increased in 2.2-2.3
times.
After variety testing analyses the prospective poplars assortment have been developed for industry production (table 2). Thus, the field research on the variety testing made in experimental and industrial plantation have allowed to allocate the best varieties and clones of poplars and to develop recommendations for their application.

From Semiluki nursery and from Astrakhan Forest Research Station shoot cutting plantations more than 5 million stem cuttings of prospective varieties of poplars have been transferred to industrial forestry production. However, the international experience of poplars cultivation has shown that eventually under different conditions different shortcomings even of carefully selected varieties and clones of poplars come to light. It is especially difficult to predict and prevent sudden manifestations and distributions of invasions and epidemics of pests and phytophases.

In this regard approaches to a variety breeding change also. If earlier breeders tried to breed for each tree species one or, at least, 2-3 superior varieties for different purposes, then now researchers have come to a conclusion that in each soil-climatic region it is necessary to have several varieties close relative according to productivity and stability characteristics but differing with genetic structure.

**Table 2.** The poplars groups recommended for various soil and climatic zones and the plantation purposes.

| Geography-climatic zones | Clones and varieties of poplars | The purposes of poplar plantations |
|--------------------------|--------------------------------|-----------------------------------|
|                          |                                | industrial massive | protective (including shelter belt) | recreation and decorative |
| Forest-steppe            | Some of the Euro-American poplars’ | 1-2*** | 1 | 1-3 |
|                          | ‘Pioneer’ | 1 | 1 | 3 |
|                          | ‘Russky’, ‘POK’** | 2 | 1 | 1-2 |
|                          | ‘E.s.-38 – Voronezh Giant’ | 1 | 1 | 1 |
|                          | ‘Sovetsky Pyramidal’ny’ | – | 3 | 1 |
| Steppe                  | Some of the Euro-American poplars’ | 1 | 1 | 1-3 |
|                          | ‘Pioneer’ | 1 | 1 | 3 |
|                          | ‘POK’*** | 1 | 1 | 1 |
|                          | ‘E.s.-38 – Voronezh Giant’ | 1 | 1 | 1 |
|                          | ‘Sovetsky Pyramidal’ny’ | – | 1 | 1 |
| Semi-desert             | Euro-American poplars | 1 | 1 | 1-3 |
|                          | *P. nigra* L. var. *pyramidalis* Roz. | 2 | 2 | 1 |
|                          | *P. alba* L. var. *Bolleana* Lauche | 2 | 3 | 1 |

*‘Brabantika-175’, ‘Vernirubens’, ‘Gelrika’, ‘Marilandika-239’, ‘Regenerata’, ‘Robusta-236’, ‘Serotina’ etc.*

**‘Pyramidal’ny-osokorev Kamyshevinsky’.

***1 – it is recommended to use; 2 – it can be used; 3 – it is not recommended.

(–) there is not enough data.

Quotes (‘…’) have designated the varieties have registered by the State Variety Commission of Russian Federation or by the International Poplar Commission of FAO.

In this regard approaches to a variety breeding change also. If earlier breeders tried to breed for each tree species one or, at least, 2-3 super varieties for different purposes, then now researchers have come to a conclusion that in each soil-climatic region it is necessary to have several varieties close relative according to productivity and stability characteristics but with different genetic structure. Breeding new varieties are made accordingly and different methods of hybridization are used [4, 19, 20].
Hybridization and variety breeding of poplars. Nowadays in the Russian Federation among many thousands of registered varieties of agricultural, fruit, officinal and ornamental plants forest tree plants occupy an insignificant share. At 01.01.2017 only 13 forest tree genotypes were registered [23]. For comparison, in China 38 varieties of poplars have been registered [6].

Among these 13 registered forest tree varieties at 01.01.2017 there were registered only 6 varieties of poplars [24]. They are ‘Pioneer’ bred by A. S. Yablokov [25], ‘Khopyorsky-1’ and ‘Priyarsky’ allocated by A. I. Sivolapov [26] and three varieties bred by A. P. Tsarev (‘Bolide’, ‘Veduga’ and ‘Steppe Lada’ [27]. This year one else variety ‘Breeze’ bred by R. P. Tsareva and V. A. Tsarev has been added to them.

In general it is possible to note that breeding and selection of prospective hybrids, clones and varieties of poplars have moved to the Central Chernozem Region of Russia. Among 16 varieties patented by 2018 a half of them have been received in the Central Chernozem Region. And from 7 registered varieties of poplars 2 of them bred in Voronezh Forest Technical University, and 4 – in All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology. Besides, one of new poplar variety ‘Surprise’ (authors R. P. Tsareva and V. A. Tsarev) has been presented on the State registration now.

All above noted poplars bred in All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology have been received by hybridization. Three of these hybrids (‘Steppe Lada’, ‘Veduga’, ‘Bolide’) have been received by full sib crosses. Two others (‘Breeze’ and ‘Surprise’) – as half-sibs. Their patent holder is the Federal State Budgetary Institution “All-Russian Research Institute of Forest Genetics, Breeding and Biotechnology”. The short characteristics of black and white poplars varieties are given below.

Varieties of black poplars. The certified variety ‘Steppe Lada’ is received from the crossing of *P. deltoides* Marsh. with a hybrid poplar bred by A. V. Al'bensky ‘Pyramidal'ny-osokorevy Kamyshinsky’. It possesses fast growth and high winter hardiness in the conditions of the Central Black Earth. At the age of 5 years the hybrid family from which the initial tree of a variety (ancestor) had been allocated with 7.2 m in height, 11.3 cm in diameter, 0.026 m³ in trunk volume, and 10 m³/hectare in wood stock. At the age of 15 this family had reached average height – 18.2 m; diameter – 31 cm; trunk volume – 0.464 m³; a wood stock of 174 m³/hectare and the current increment more than 20 m³/hectare/year. The family already validly surpassed control in growth at the age 18 by 1.7 folds. At the age of 38 years height of an initial tree of the variety was 25 m, diameter 47.8 cm, trunk volume 1.71 m³ (figure 1).
The variety ‘Steppe Lada’ is intended for massive, shelter belt and other forest reclamation plantations. In view of fast growth and high winter hardiness, the variety is effective for creation of the plantation, including for production of renewable energetic resources. Use of this variety in shelter belt plantings will allow reducing the term of their payback period.

The certified variety ‘Breeze’ in view of fast and high winter hardiness is effective for the plantation, including for production of renewable energetic resources. The variety is selected as the half-sib of a female variety ‘Pioneer’ bred by A. S. Yablokov. Subsequently it had been multiplied and tested under the different soil and climatic circumstances. Use of this variety in shelter belt plantings allows reducing their payback period. As the male clone it can be used in landscape gardening.

At the age of 7 years hybrid family from which the initial tree of a variety had been selected had shown height 10.8±0.46 m; diameter – 14.9±0.78 cm; trunk volume – 0.073±0.0096 m³; a wood stock – 45.26 m³/hectare. At the age of 14 years this family had reached average height – 16.5±0.75m; average diameter – 26.3±0.74 cm; trunk volume – 0.359±0.05 m³; wood stock – 219.0 m³/hectare and the current increment – more than 20 m³/hectare per year. This family validly surpassed control in the trunk volume on 5 percent significance value (HCP₀.₀₅ = 2.17). The initial tree at the age of 32 years reached height of 26 m, diameter – 46 cm, the volume of a trunk – 1.47 m³ (figure 1).

The presented to the State variety testing poplar ‘Surprise’ had been selected as a half-sib from family of the Italian poplar ‘I-455’ which at the age of 7 years had average height 8.5±0.32 m, diameter 13.1±0.59 cm, average trunk volume 0.041±0.0064 m³, wood stock 27.68 m³/hectare. At 14-year age these indices had increased respectively to 16.0±0.60 m, 26.1±0.62 cm, 0.334±0.04 m³ and 199.73 m³/hectare. The initial tree of the variety at 30-year age had reached height of 21.5 m, diameter of 44.5 cm and the volume of the trunk 1.29 m³.

The described varieties ‘Steppe Lada’, ‘Breeze’ and ‘Surprise’ – are recommended for Voronezh, Belgorod, Kursk, Lipetsk, Tambov, Volgograd, Saratov and other regions located in forest-steppe and steppe zones.
Varieties of white poplars. The poplar variety ‘Veduga’, received from crossing of *P. alba* L. from Voronezh with *P. alba* L. var. *Bolleana* Lauche from Astrakhan, possesses pyramidal crown, beautiful silvery leaves and high winter hardiness under the conditions of the Central Black Earth region. It’s intended for use in the decorative purposes, in shelter belt afforestation and other reclamation. In view of a pyramidal crown it has high esthetic effect when gardening. In shelter belt plantings in relationship with correlation between projections of the crown and distribution of the root systems allows reducing the arrangement place under forest landings that increases their efficiency. However due to its root shoot ability it needs to be entered into the middle rows of shelter belts where soil-cultivating tools don’t damage its roots and don’t stimulate its root shoots appearance.

Ancestor of this variety at 18-year age validly surpassed control (for 85 %). At the age of 28 years the initial tree of the variety had reached in height 24.5 m, in diameter – 42.4 cm, in trunk volume – 1.35 m³ (figure 2).

![Figure 2](image)

Figure 2. The ancestors of white poplars varieties: on the left side – poplar ‘Bolide’, on the right side – poplar ‘Veduga’. The collection of hybrids No. 1 in the Semiluki forest nursery in the Voronezh region. Photo by A. P. Tsarev.

The poplar variety ‘Bolide’ is also received from crossing of *P. alba* L. from Voronezh with *P. alba* L. var. *Bolleana* Lauche from Astrakhan. It possesses pyramidal crown, silvery leaves and high winter hardiness under the conditions of the Central Black Earth. The variety is intended for use in the decorative purposes and in shelter belt afforestation. Because of extremely narrow pyramidal (cypress) crown it’s of special value in gardening of settlements. In shelter belt plantation, also as well as when using a variety ‘Veduga’, in relationship with correlation between projections of the crown and distribution of the root systems allows reducing the arrangement place under forest landings that increases their efficiency. Ancestor of this variety at 18-year age surpassed control (18 %). At the age of 38 years the initial tree had reached height of 26 m, diameter – 43 cm, the volume of a trunk – 0.83 m³ (see figure 2).

White poplars varieties, as well as black poplars, on the basis of the carried-out field tests, are recommended for Voronezh, Belgorod, Kursk, Lipetsk, Tambov, Volgograd, Saratov and other regions located in forest-steppe and steppe zones. Now their reproduction in the nursery site of the
All-Russian Institute of Genetics, Breeding and Biotechnology has been doing. They can be used both in forestry and landscape gardening.

**Aspen factorial hybridization.** The new stage of breeding and researches of the received aspen hybrids which had been carried out in recent years have shown a possibility of genetic assessment of their parental trees and selection of prospective forms among descendants [28]. These series had included also factorial crossings between fast-growing and heart rot resistant parental forms and parents, unstable to decay, that will allow to establishing the future genetic conditionality of disease resistance and to breed heart rot resistant aspen genotypes.

Results of preliminary observations on the constant experienced sites created in the previous year from these hybrids have shown that plants are in satisfactory conditions. Survival of aspen seedlings planted in the Typical Chernozem is 100 %, and in the Gray Forest sandy loam furrows had been plowed after clear cutting – 80 %. Researches on the created objects will allow selecting heart rot aspen steady genotypes.

**Conclusions**

Heterogeneity of soil and climatic conditions of different zones of vegetative growth demand the differentiated approaches to selection and breeding of forest tree species varieties. In the European part of Russia where the deficiency of local timber production is observed, it is necessary to enter fast-growing and winter-hardy varieties of poplars. Breeding works with poplars in Central Black Earth Region have allowed to select a number of prospective varieties, clones and forms and to develop prospective assortment for industrial, shelter belt and landscaping. Hybridization allowed creating a number of new winter-hardy, fast-growing and decorative varieties. Among them it is possible to note ‘Steppe Lada’, ‘Veduga’, ‘Bolide’, ‘Breeze’ and ‘Surprise’. The first four varieties were registered by the State Commission of the Russian Federation on a Variety Testing and have taken out the relevant certified documents and patents. The last variety ‘Surprise’ is in process of the State registration. The new factorial aspen hybrids will allow selecting steady to a heart rot genotypes. Using the certified varieties will allow weakening local timber deficiency, to carry out reclamation of the broken lands and to fill up the assortment for landscape gardening in the Central Chernozem Region.

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