Abstract—Authentication of Syringa varieties is required in all major collections. The initial information left by the originators does not make it possible to uniquely identify the varietal affiliation of the samples. In most existing descriptions of varieties, even detailed ones, subjective categories are largely used. The most interesting for the study of intraspecific and intragenital variability, molecular genetic studies, introduction and selection work, as well as for practical gardening are varieties belonging to the S. vulgaris and S. × hyacinthiflora.

The aim of the study was to identify a set of constant morphological features that allow us to reliably distinguish and identify varieties of S. vulgaris and S. × hyacinthiflora. On the basis of long-term observations of the collection of lilacs MBG RAS compiled a sample passport varieties of lilacs, which is an expanded detailed unified description. Of the selected features, 44 were the basis for “Methods of testing for distinctiveness, homogeneity and stability SYRINGA L.” № 12-06/32 from 02.08.2010, FSU State Commission of the Russian Federation for testing and protection of breeding achievements (RTG/1086/1).

Keywords – MBG RAS, collection fund, Syringa, varieties

I. INTRODUCTION

The genus Syringa L. includes more than 2300 ornamental intraspecific and interspecific cultivars, the diversity of which is very large. Lilac is in demand not only in horticulture, but also as an object for molecular genetic studies, which have both applied and theoretical significance [1-3]. It is important to study the possibilities of reproduction of lilacs by tissue culture [4]. It is obvious that the solution of these problems is possible only if the objects of research are genuine varieties.

Authentication of Syringa L. varietals is required in all major collections. For long-lasting tree crops, such as lilac, whose age is estimated in tens and hundreds of years, the exact definition of varietal belonging of samples is especially important, especially since the variety can be preserved as a single specimen. The initial information left by the originators does not make it possible to uniquely identify the varietal affiliation of the samples. In most existing descriptions of varieties, even detailed ones, subjective categories are largely used. At the same time, attention is paid mainly to the generative sphere, while vegetative signs are described in General words. Many varieties do not have detailed descriptions at all, but only a brief indication of the type of color and structure of the flower. Conventional photographs do not give a complete picture of the characteristics of varieties, because they do not carry sufficient information about the variations of individual characteristics over the years and during one growing season [5]. The method of identification of S. vulgaris varieties by the complex of morphological features of the Corolla structure developed in the SBU RAS [6] is the beginning of work on the preparation of a detailed unified description.

The most interesting for the study of intraspecific and intragenital variability, molecular genetic studies, introduction and selection work, as well as for practical gardening are varieties belonging to the common lilac (S. vulgaris L.) and related to it S. × hyacinthiflora Rehder. The latter is an interspecific hybrid S. oblata × S. vulgaris. Expressed morphological differences in General terms of the structure of the varieties of these species do not have.

It is not always enough to rely on the morphology of the flower to distinguish varieties. It is also necessary to take into account other features that are not key to assess the decorative variety.

The purpose of the research was to identify a set of constant morphological features that allow to reliably distinguish and identify varieties S. vulgaris and S. × hyacinthiflora.

II. EXPERIMENTAL

The research was carried out on the basis of the lilac collection of GBS RAS from 1999 to 2018. A comparative morphological analysis of 160 varieties of S. vulgaris and 13 varieties of S. × hyacinthiflora were carried out. With the help of a digital camera and a scanner, identification images were obtained, which show flowers and buds in 10 main positions (repetitions from 6 to 30 depending on the characteristics of the variety); inflorescences in 4-5 main positions; shoots with leaves; shoots without leaves: leaves in 2 main positions (by the number of nodes on the shoot). Also, General (on vegetating plants) images of inflorescences and their fragments, bushes and their fragments in the amount necessary for adequate generalized visual perception of the variety/species were obtained.

III. RESULTS AND DISCUSSION

On the basis of long-term observations of the collection of lilacs MBG RAS compiled a sample passport varieties of lilacs, which is an expanded detailed unified description (tables I-V). The description must be accompanied by special identification images-photos reflecting the essential features of the variety.
**TABLE I. VARIETY DESCRIPTION (PLANT AND SHOOT)**

| Indication                | Degree of manifestation | Indication                | Degree of manifestation |
|---------------------------|-------------------------|---------------------------|-------------------------|
| **Plant:** habitus        | oblong                  | **Shoot:** strength       | flexible                |
|                           | obovate                 |                           | average strength        |
|                           | rounded                 |                           | durable                 |
|                           | branchy                 |                           |                         |
| **Plant:** bush height    | stunted (less than 2 m) | **Shoot:** the length of the internodes | shortened               |
|                           | average height (2-3 m)  |                           | normal (average)        |
|                           | high (more than 3 m)   |                           | extended                |
| **Plant:** density of crown | rare          | **Shoot:** the color of bark | gray                   |
|                           | medium density          |                           | green                   |
|                           | thick                   |                           | yellow                  |
| **Shoot:** shape          | straight or slightly curved |                         | brown                   |
|                           | arcuate                 |                           | purplish brown          |

**TABLE II. VARIETY DESCRIPTION (BUD AND LEAF)**

| Indication                | Degree of manifestation | Indication                | Degree of manifestation |
|---------------------------|-------------------------|---------------------------|-------------------------|
| **Bud** (top pair): shape | rounded                 | **Leaf:** the nature of the departure of the petiole from the escape | at an acute angle to the axis |
|                           | pointed                 |                           | perpendicular to the axis |
| **Bud** (top pair): color | green                   | **Leaf:** pubescence      | absents                 |
|                           | brown                   |                           | yellow                  |
|                           | purplish brown          |                           | yellow-green            |
| **Leaf:** type            | simple                  | **Leaf:** color           | light green              |
|                           | complex                 |                           | green                   |
| **Leaf:** length          | small (length without petiole less than 6 cm) | **Leaf:** the character of color | dark green              |
|                           | medium (6-9 cm)         |                           | evenly colored           |
|                           | large (over 9 cm)       |                           | motley                  |
| **Leaf:** form of the leaf blade | lanceolate | **Leaf:** anthocyanin color | missing or very weak |
|                           | pointed-elliptical       |                           | presents                |
|                           | pointy-egg-shaped        |                           | present only on young leaf |
| **Leaf:** surface         | ovate                   | **Leaf:** shine           | Brilliant                |
|                           | cordate                 |                           | green                   |
|                           | smooth                  | **Leaf:** autumn coloring | yellow                  |
|                           | wrinkled                |                           | purple                  |
|                           | wavy                    |                           | brown                   |
| **Leaf:** density         | soft                    |                           | other                   |
|                           | dense                   |                           |                         |
| **Leaf:** venation        | unobtrusive             |                           |                         |
|                           | noticeable              |                           |                         |
| **Leaf:** petiole length (relative to the length of the plate) | short | **Leaf:** the nature of autumn color | evenly colored          |
|                           | average                 |                           | spotted                 |
|                           | long                    |                           |                         |

**TABLE III. VARIETY DESCRIPTION (INFLORESCENCE)**

| Indication                | Degree of manifestation | Indication                | Degree of manifestation |
|---------------------------|-------------------------|---------------------------|-------------------------|
| **Inflorescence:** location on the bush | open | **Inflorescence:** shape | cylindrical |
|                           | hidden in the leaves |                           | pyramidal               |
| **Inflorescence:** number of pairs of panicles on the shoot | two | **Inflorescence:** branching | compact |
|                           | one                    |                           | highly branched         |
|                           | three or more          |                           | short                   |
|                           | the maximum (number)   |                           | average length          |
| **Inflorescence:** the presence of leaves | absent | **Inflorescence:** length of branches | long |
|                           | are                    |                           |                         |
|                           | short (less than 15 cm)|                           |                         |
|                           | average (15-25 cm)     |                           |                         |
|                           | long (over 25 cm)      |                           |                         |
| **Inflorescence:** size (length) | erect | **Inflorescence:** divergence of branches | very sharp |
|                           | drooping               |                           | about 45°               |
|                           | hanging                |                           | about 90°               |
| **Inflorescence:** position in space (strength) | openwork | **Inflorescence:** number of flowers in the final brush | (number) |
|                           | loose                  |                           |                         |
|                           | average density        |                           |                         |
|                           | dense                  |                           |                         |
| **Inflorescence:** density | very dense             |                           |                         |
| Indication                                      | Degree of manifestation | Indication                                      | Degree of manifestation |
|------------------------------------------------|-------------------------|------------------------------------------------|-------------------------|
| **Flower: size (diameter)**                   |                         | **Flower: the main color in the period of full flowering** |                         |
|                                               | small (up to 1 cm)      |                                               | white                    |
|                                               | medium (1-2 cm)         |                                               | purple                  |
|                                               | large (2-3 cm)          |                                               | blush                   |
|                                               | very large (over 3 cm)  |                                               | lilac                   |
|                                               |                         | **Flower: the shape of a Bud**                 |                         |
| **Flower: the size of the Bud (diameter)**   |                         |                                               |                         |
| to the beginning of the opening of the        |                         | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Corolla tube**                              |                         |                                               |                         |
| **Flower: flower**                            |                         |                                               |                         |
| **Flower: color Bud to the beginning of the   |                         |                                               |                         |
| **Corolla tube**                              |                         | **Flower: the color of the center and/or borders of the upper side, different from the main** |                         |
| **Flower: the shape of a Bud**                |                         |                                               |                         |
|                                               | Oblate                  | **Flower: the nature of the color of the Corolla tube bend** |                         |
|                                               | Round                  |                                               |                         |
|                                               | Oval                   |                                               |                         |
|                                               | Long                   |                                               |                         |
| **Flower: flower**                            |                         | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: type**                              | Half-double (1 full and 1 incomplete Corolla) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Terry (2-3 Corolla)    | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Strongly terry (more than 3 crowns) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Absents                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: tube curvature**                    |                        |                                               |                         |
| **Flower: flower**                            | Short (less than the diameter of the Corolla) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Average (equal to the diameter of the Corolla) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Long (larger than the diameter of the rim) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: length of Corolla tube to bend**    | Lanciculate            | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Elliptic               | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Ovate                  | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Obovate                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Rounded                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Squeezed               | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Pointed                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | With a beak-like tip  | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Flat                   | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Concave                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Refused                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Deflected              | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Asymmetric             | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: position of Corolla bends**         | Flat                   | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Convex                 | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Concave                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Refused                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Deflected              | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Asymmetric             | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: position of Corolla bends**         |                        |                                               |                         |
| Only semi-double and double flowers: **Flower: flower** |                        |                                               |                         |
| **Flower: flower**                            | Closely spaced         | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Slightly parted        | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Move apart             | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Very spread            | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | The center is closed   | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | The center is open     | **Flower: the nature of the color of the Corolla tube bend** |                         |
| Only semi-double and double flowers: **Flower: flower** |                        |                                               |                         |
| **Flower: flower**                            | Characteristic of S. vulgaris | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Specific               | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Verbal description    | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Homogeneous            | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Changing to the center of the Corolla | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Varying in radius (striping) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | With a border on the edge | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Average                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Long                   | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Strongly terry (more than 3 crowns) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Absents                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Short (less than the diameter of the Corolla) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Average (equal to the diameter of the Corolla) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Long (larger than the diameter of the rim) | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Lanciculate            | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Elliptic               | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Ovate                  | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Obovate                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Rounded                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Squeezed               | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Pointed                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | With a beak-like tip  | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Flat                   | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Concave                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Refused                | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Deflected              | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Asymmetric             | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: position of Corolla bends**         |                        | **Flower: the nature of the color of the Corolla tube bend** |                         |
| Only semi-double and double flowers: **Flower: flower** |                        | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Closely spaced         | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Slightly parted        | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Move apart             | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | Very spread            | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | The center is closed   | **Flower: the nature of the color of the Corolla tube bend** |                         |
| **Flower: flower**                            | The center is open     | **Flower: the nature of the color of the Corolla tube bend** |                         |
TABLE V. VARIETY DESCRIPTION (FLOWERING AND FRUCTIFICATION)

| Indication            | Degree of manifestation |
|-----------------------|-------------------------|
| Flowering: start time | early, average, later   |
|                       | start date (average)    |
| Flowering: duration   | short, average duration |
|                       | long                    |
| Flowering: profusion  | weak, average           |
|                       | abundant                |
| Flowering: the frequency (abundance) | not annual, annual |
|                       | absents, weak           |
| Fructification        | normal                  |

Of the selected features, 44 were the basis for "Methods of testing for distinctiveness, homogeneity and stability SYRINGA L.» № 12-06/32 from 02.08.2010, FSI State Commission of the Russian Federation for testing and protection of breeding achievements (RTG/1086/1).

IV. CONCLUSION

The proposed scheme of morphological description contains a sufficient number of positions that allow with a certain degree of reliability to distinguish varieties of lilac even in the non-flowering state, which is important for its reproduction, including microclonal. Classical morphological analysis should precede the study of lilac varieties at the molecular level in order to minimize the probability of erroneous determination of the variety sample taken for the study. It is also important in the selection of samples for mass reproduction of tissue culture.

A comprehensive approach to certification of lilac varieties, including morphological and molecular genetic methods, is able to provide reliable identification of varieties. Certification of varieties in lilac collections will increase the reliability of preserving the genetic diversity of the genus in vivo and in vitro, increase the efficiency of research and breeding work.

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REFERENCES

[1] E.Z. Kochieva, N.N. Ryzhova, O.I.Molkanova, A.M. Kudryavcev, V.P. Upelniek, I.B. Okuneva, “The Genius Syringa: molecular labeling of species and varieties”, Genetika, vol. 40, №1, pp. 37-41, 2004 (in Russian).
[2] N.V. Meñikova, E.V. Borhert, S.P. Martynov, I.B. Okuneva, O.I.Molkanova, V.P. Upelniek, A. M. Kudryavcev, “Use of molecular genetic markers for verification of in vitro collections of common lilac (Syringa vulgaris L.)”, Genetika, vol. 40, №1, pp. 37-41, 2004 (in Russian).
[3] E.M. Lyah, “Adaptation of molecular methods for identification of varieties Syringa vulgaris L.”, Hortus botanicus, vol. 12, pp. 361-366, 2017, Available at: http://hb.karelia.ru/journal/article.php?id=4942 (in Russian) DOI: 10.15393/j4.art.2017.4942 (Accessed 28 September 2019).
[4] O.I. Molkanova, O.A. CHurikova, L.N. Konovalova, I.B. Okuneva, “Features of microclonal reproduction of Syringa vulgaris L.”, Bulletin of MSU, №4, pp. 8-14, 2002.
[5] I.B. Okuneva, “From the history of the creation and study of the collection of lilacs MBG RAS”, Materials of the International scientific and practical conference «INTERNATIONAL SYRINGA 2018», Moscow, Saint-Petersburg, OOO «KLUB PECHATI» Publ., 2018, pp. 267-272 (in Russian).
[6] K.N. Shuavaeva, Principles of identification and classification of varieties Syringa vulgaris L. on the basis of the structure of the Corolla Cand. Diss. Moscow, 2012. 135 p.