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Evaluation of autumn aster sympphyotrichum novi-belgii in the conditions of central Europe thermophitics

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Abstract
Species *Symphyotrichum novi-belgii* is valuable for many reasons, mainly for colour and abundance of flowering that occurs in autumn season, but equally for its hardiness and vigorosity. Currently, there is around 300 cultivars available on the market, but despite of the abovementioned hardiness and vigorosity, not all these cultivars are suitable for conditions of central Europe region. The aim of two-year field experiment was selection of suitable cultivars for central Europe region, based on evaluation of morphological and physiological traits of 20 cultivars.

Keywords: *Symphyotrichum*, valuation, assortments, autumn asters, variety

Introduction

New Belgian asters where firstly introduced to Europe from North America in 1710[4]. Original area of expansion is Atlantic coast of North America, from South Carolina to Labrador and Newfoundland [5]. In central Europe, this species occurs wildly mainly among rivers, roads and railroads tracks [14].

Symphyotrichum novi-belgii (L.) Nesom (syn. *Aster novi-belgii* L.) belongs to the subgenus *Symphyotrichum* and have chromosome number 8, and very often is hybridized with section Dumosi [16]. Plants have densely habitus, stems are thin, sometimes reddish colored and glabrous, height ranges between 0, 17–1, 0(–1,4) m. Leaves are spear shaped, sessile, during flowering, leaves start to dry from the bottom of the stem. Ray like flowers are mostly purple blue, very rarely pink or white. *Symphyotrichum novi-belgi* is morphologically very variable species, whit wide genetic basis [2].

Interspecific breeding programs had result in extension of spectrum of cultivars, for example: for cut flower production or garden cultivation, or both [6]. The width of the spectrum could be clearly demonstrated by comparing descriptions from various professional producers. New moon nursery states plant high from 0, 9 to 1,20 m, and consider it as hardy plant suitable for USDA zone 4–8. They also recommend to cut stems to height of 0, 15 m in late June, to produce thicker stems [18]. Connecticut botanical society states plant height between 0, 3–0, 9 m and blooming from August till October [19]. This species is not important only from ornamental point of view, autumn asters are also considered as honeybee plants, that provides nectar in the autumn period [17].

Symphyotrichum novi-belgii is, with no doubts, the most commonly breaded species and also a species with most varieties. Exist more than 1 000 varieties, but only one third (around 300) of them is currently available on market [15]. Flower breeders have focused on creating low-maintenance perennials and *S. novi-belgii* was primarily bred as heat and/or drought tolerant species [1]. Other aspect of low-maintenance is resistance to pests and diseases. It is known, that different species of *Aster* varies in their degree of susceptibility to diseases, and the most susceptible are varieties of *S. novi-belgii*, specifically they are sensitive to *Verticilium alboatrum* and *Erysiphe cichoraceum* [8].

Assortment valuations of ornamental plants become more and more important in recent years, because it brings important data for the future plant breeding. These types of data is essential for improving of assortment and also are helping customers to choose the most suitable plants in terms of changing climate. Valuation focused on specific climatic regions or termophytic areas of the world provides important information about surviving rate after winter or pests and diseases susceptibility rates.

Materials and Methods

Experiment took place at Mendels University in Lednice, during 2014 and 2015. Lednice is classified as warm area, sum of active temperatures is more than 2 800 °C. Subarea is mostly dry, minimal temperature is above -18 °C. According to Koppeneov classification, is characteristic for this area, that rainfalls are cumulated between beginning of spring and beginning of summer, after follows longer dry period [13]. Nutrient supply in the soil was determined in 2015, by Melich III method, and content of nutrients is as follow: 232 mg/kg K, 77mg/kg P, 272 mg/kg Mg, 6 970mg/kg Ca a capillary action is 376 mol/l, pH is 7, 48.

Material

Twenty cultivars were evaluated, which were donated by Prague Botanical Garden and two gardening shops, Zahradnictví Krulichovi and Pereny. Taking into account the broadness of cultivar range, we chose 20 of them with effort to include as broad combination of different characteristic as possible.

Plants were planted in 2014, in rows (spacing 0, 7 × 2,0 m) oriented in north-south direction and from the east have been protected by greenhouse. A black non-woven garden textile was applied as a protection against weeds. Plants were irrigated once a week during the summer and any pesticides or fertilizers were used during experiment.

Methods

Seven basic characteristics were evaluated on 20 plants of every cultivar. Measured values were:

Plant high [m] - measured from the soul surface to the highest point of the terminal flower, in stage when 50 % of flowers were flowering.

Localization of the branching [m] - was measured as the high from the soul surface to the point where the first branching appeared, in stage before flowering.

Number of ray flowers and number of inflorescences on paracladium were counted on 30 flower stems and averaged.

Color of the ray flowers was determined by the valuator P. Komárek, on bright sunny day with RHS color chart with 920 colors.

Flowering date was determined as date when first flowers have opened. We consider plant to be flowering early in the month if the flowers open between first and 12th day of the month, middle month if flowering was between 13th and 22nd day of the month and late in month flowering was between 23th and last day of the month.

Propensity to the flower stem falling was evaluated on the individual observation of the valuator P. Komárek during both years of the experiment.

Habitus was determined during stage of full bloom (at least half of the flowers was open). A simple scale was used: 1 means excellent habitus, 2 means average with some minor flaws, 3 means unsatisfactory.

Results and Discussion

According to evaluation, the most perspective varieties which fulfill several parameters were chosen. Parameters were as follow: height between 0,9–1,5 m, branching of the stem under 0,5 m of height, flowering from middle to the end of September, no flower stem falling, inflorescences with diameter bigger than 30 mm and number of ray flowers more than 30–40. Almost all the parameters where aimed on the flower habitus in the time of full bloom which is the most important time from the view of ornamental gardening. Results are shown in Table 1. Only three cultivars perfectly fulfill abovementioned paramaters, specifically: 'Dauerblau', 'Schneeberg' and 'Strawberry and Cream'.

First of the best varieties is according to our experiment *Symphyotrichum novi-belgii* 'Dauerblau', with height 1,4 m. MEIER (1973) claims that 'Dauerblau' height ranges between 1,0-1,2 m, but OPATRNÁ (1976) claims height between 1,1-1,3 m and PICTON (1999) claims height just 0,9 m[7,8,9]. HERTLE et LEYHE (2008) and SIEBER (1990) say height around 1, 2-1, 4 m which agree with our results [10, 12]. OBERDORFER (1994), as the only author, claims that height is around 1, 5 m [11]. Average inflorescence diameter for variety 'Dauerblau' during evaluation was 39 mm. OPATRNÁ (1976) claims, that diameter of inflorescence ranges between 45-49 mm, what is almost 10 mm larger in compare with our results [8]. MEIER (1973) claims diameter aroun 35-50 mm [7], what agree with our results, our diameter 39 mm is in the middle of Meiers value range. HERTLE et LEYHE (2008) claim, that variety 'Dauerblau' is well known for quality blooming, which correspondent with our results [10]. OPATRNÁ (1976) point out the possibility of damaging plants by fungal diseases, but during our evaluation no such harm was recorded. It has to be taking into account that absency of fungal disease could be caused by dry sunny weather during whole season [8].

Second best variety was *Symphyotrichum novi-belgii* 'Schneeberg'. High of this variety is according to our measurements 0,9 m, what is the lower border of the span 0,9–1,1 m, that state HERTLE & LEYHE (2008) [10]. Authors also claim, that variety doesn't suffer by flower stem falling, what correspond with our results.

Third variety is *Symphyotrichum novi-belgii* 'Strawberry and Cream' with height around 1 m. OBERDORFER (1994) claims the maximal height for this variety is just 0, 8 m [11], and MEIER (1973) recorded height in range 0,9 - 1,4 m[7]. According to our measuremnts, the inflorescence diameter is 31 mm, which is almost identical to values claimed by MEIER (1973) [7].

On the lowest positions of the chart are two varieties 'Boningale White' and 'Fuldatal'. Second worst rated variety was Symphyotrichum novi-belgii 'Fuldatal', which is 1,0 m tall which correspond with the result of HERTLE & LEYE (2008) [10] and is strongly suffering by flower stem falling.

And the worst rated variety was *Symphyotrichum novi-belgii* 'Boningale White' which is according to our measurements 1, 12 m high. But many authors PICTON (1999), SIEBER (1990) and OBERDORFER (1994) recorded lower values, specifically 0, 85-0, 9-1, 0 m [9, 12, 11]. Only HERTLE et LEYHE (2008) recorded higher range 0, 9–1, 2 m, which agree with our results. Moreover, HERTLE et LEYHE (2008) point out that variety is prone to flower stems falling, what was also proved during our evaluation [10].

All differences in plant height could be caused by different nutritional status during each author experiments, by the climate or by exposition of the experimental ground.

Tables and Figures

Table 1: Averaged values for 20 evaluated cultivars

Cultivars	Plant height [m]	Localization of the branching [m]	Inflorescence diameter [cm]	Number of ray flowers	Colour of ray flowers	Flowering date	Falling of the flower stems	Plant habitus
Bahamas	0,3	0,2	39	41	Pink purple	Lat IX.	No	2
Barbados	0,4	0,2	27	39	Light blue	Lat IX.	No	2
Boningale White	1,12	0,55	40	35	White	Ear IX	Yes	3
Crimson Brocade	0,84	0,36	31	58	Crimson red	Ear IX	No	2
Dauerblau	1,4	0,5	39	35	Blight blue purple	Lat IX.	No	1
Fellowship	0,79	0,3	55	52	Light pink	Lat VIII.	No	2
Fuldatal	1	0,52	42	60	Pink	Lat IX.	Yes	3
Karminkuppel	0,85	0,32	30	57	Dark pink	Ear IX.	No	2
Little Pink Beauty	0,41	0,15	41	35	Dark pink	Mid IX	No	2
Lomnice	0,43	0,16	40	34	Strong pink	Lat IX.	No	2
Melbourne Bell	0,72	0,4	37	55	Pink	Mid IX.	Yes	2
Rosenquartz	0,65	0,28	31	36	Light pink	Mid IX.	Yes	2
Royal Blue	0,96	0,59	35	60	Lavender blue	Ear IX.	Yes	2

Royal Velvet	0,97	0,5	34	39	Blue purple	Lat IX.	No	2
Sailor Boy	0,95	0,6	35	35	Blue purple	Ear IX.	No	2
Samoa	0,75	0,5	34	34	Blue purple	Mid IX.	No	2
Sarah Ballard	0,8	0,35	31	28	Pink	Ear IX.	No	2
Schneeberg	0,9	0,32	31	36	White	Lat IX.	No	1
Strawberry and Cream	1	0,49	31	33	Light pink	Mid IX.	No	1
Trudy Ann	0,56	0,27	46	35	Purple	Mid IX.	No	2

Legend: Flowernig date: Ear – early, Mid – middle, Lat - late

Plant habitus: 1 - excelent, 2- average, minor flaws, 3 - unsatisfactory

Conclusions

The main result experiment is the suitability chart of *Symphyotrichum novi-belgii* varieties for cultivation in central Europe region. The best rated varieites were 'Dauerblau', 'Strawberry and Cream' a 'Schneebarg', thus they are really good for the middle Europe termophytic conditions. As the least suitable varieties were rated 'Boningham White' a 'Fuldatal', and the main reason was flower stem falling, what ment lower esthetic qualities of the plant. The remaining 15 varieties can be used in the middle Europe termophytic conditions, but their esthetic value is just average.

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