New observations of garden escapes in Meise Botanic Garden (Belgium), part 2

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Abstract. – *As a continuation of previous studies on the subspontaneous flora of Meise Botanic Garden (MBG), this paper presents several new records of vascular plants that escaped from the garden. A total of 21 taxa not previously recorded are presented, seven of which have not been recorded before in the wild in Belgium. The naturalization status of these taxa varies from ephemeral to naturalized and potentially invasive. For each taxon, we provide information on its native distribution, invasiveness, occurrence within MBG collections and as escapes from the collections, its status in Belgium and beyond, and references to herbarium collections preserved at the Meise Botanic Garden (BR). Where relevant, additional information on related species is also given. A number of taxa are illustrated with photographs.*

Résumé. – ***Nouvelles observations d'espèces échappées des collections au Jardin Botanique de Meise (Belgique) : seconde partie.*** *Plusieurs nouvelles observations intéressantes d'espèces de plantes vasculaires ont été faites dans le domaine du Jardin Botanique de Meise lors d'inventaires réalisés depuis 2011, en continuation d'études antérieures de la flore subspontanée. Cet article présente 21 nouveaux taxons, dont sept ont été observés pour la première fois en Belgique à l'état subspontané. Le degré de naturalisation de ces taxons varie d'éphémère à naturalisé, certaines espèces étant potentiellement envahissantes. Pour chaque taxon, nous mentionnons l'aire d'indigénat et le degré d'envahissement, leur présence au Jardin comme plante cultivée et échappée de culture, leur statut en Belgique et ailleurs, les collections conservées dans l'herbier du Jardin (BR) et, s'il y a lieu, des notes sur des espèces apparentées. Quelques taxons sont illustrés par des photos.*

Samenvatting. – ***Nieuwe waarnemingen van collectievlieders in het domein van Plantentuin Meise (België): deel 2.*** *Als een vervolg op eerdere studies over de subspontane flora van het domein van Plantentuin Meise worden 21 nieuwe taxa voorgesteld, waarvan zeven die nog niet eerder in België in het wild werden aangetroffen. De inburgeringsstatus van de waargenomen taxa varieert van efemeer tot ingeburgerd en potentieel invasief. Van elk taxon wordt informatie gegeven over het herkomstgebied, hun al dan niet invasief karakter, hun aanwezigheid in de Plantentuin als gekweekte en ontsnapte soort, hun status in België en daarbuiten, herbariumspecimens bewaard in het herbarium van Plantentuin Meise (BR) en, waar relevant, notities over nauw verwante soorten. Enkele taxa zijn geïllustreerd met foto's.*

Illustrations :
all photos by the first author, except Fig. 1 (O. Van de Kerckhove), Fig. 2 (K. Stevens) and Fig. 9 (P. Borremans).

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Introduction

A substantial proportion of invasive alien plant species worldwide originated as ornamental garden plants. For instance, more than half of the species listed among the world's 100 worst invasive organisms are garden escapes (Lowe *et al*. 2000). In countries such as Australia, New Zealand, and the United States, over 50% of all naturalized plants and weeds are former garden plants. This group of neophytes plays a major role in global plant introductions, with significant impacts on biodiversity (Downey & Glanznig 2006).

While escapes often originate from private gardens, botanic gardens can also act as sources of introduction. These institutions maintain diverse and often globally unique collections, which may include taxa with invasive potential (Galera & Sudnik-Wójcikowska 2010). Recognizing this risk, various codes of conduct have been developed, such as the European Code of Conduct for Botanic Gardens on Invasive Alien Species (European Botanic Gardens Consortium, accessed 14 February 2025), which emphasizes the importance of monitoring and documenting potential escapes.

Meise Botanic Garden (MBG), located near Brussels (Belgium), holds one of the most extensive living plant collections in Europe. Its diversity, size, and long cultivation history make it a valuable

case study to assess the behaviour of cultivated taxa outside managed settings.

This paper continues the inventory begun in *New observations of garden escapes in Meise Botanic Garden, Part 1* (Ronse & Verloove 2021). It presents 21 additional taxa that have escaped cultivation within MBG. For each species, we document its cultivation history at MBG, observed escapes, and spread within the domain, as well as its status as an escapee in Belgium. Herbarium specimens and spatial data are provided where available.

Material and methods

Study site — Meise Botanic Garden (MBG; formerly the National Botanic Garden of Belgium) is located approximately 15 km north of Brussels and covers a 92-hectare estate. The domain comprises a mosaic of habitats, including lawns, grasslands, woodland patches, and cultivated areas (Fig. 1). The garden was developed around two historical estates and includes both heritage buildings and modern infrastructure. Since 2021, several new areas have been added, such as the Green Ark greenhouse complex, the Medieval Garden, and the Island Garden. Some older collections have been renamed (e.g. the Herbetum is now the Cronquist Garden).

Botanical collections and monitoring — MBG maintains extensive living plant collections in both outdoor plantings and greenhouses. Since 2011, regular surveys of alien flora within the domain have been conducted by the first author. These surveys focus on cultivated taxa that have escaped cultivation (i.e. garden escapes) and include data on location, population size, growth stage, and potential for spread.

Taxonomy and nomenclature — Scientific names follow *Plants of the World Online* (POWO), facilitated by the Royal Botanic Gardens, Kew, with date of access indicated. This source also provides the primary reference for native and introduced ranges, supplemented by additional literature where relevant.

Data collection and spatial mapping — For each taxon, the precise location of cultivated and escaped individuals was recorded using MBG's internal sector system, originally developed for garden management. This system has been updated to reflect recent infrastructural changes (Fig. 2).

To assess the most likely source of escape, the corresponding cultivated accessions were identified using the Botanical Collections online database, filtering for 'Living Collections' at MBG. Spatial relationships between cultivated and escaped individuals were analysed to infer possible origin points.

Additional distribution data — The occurrence of each taxon as a garden escape in Belgium was verified using the Manual of the Alien Plants of Belgium, supplemented by additional sources on its status as a neophyte or invasive species globally.

When available, herbarium specimens were cited; all vouchers are housed in the herbarium of Meise Botanic Garden (acronym: BR).

Figure 1. Updated map of the domain of Meise Botanic Garden in Meise (province of Flemish Brabant).

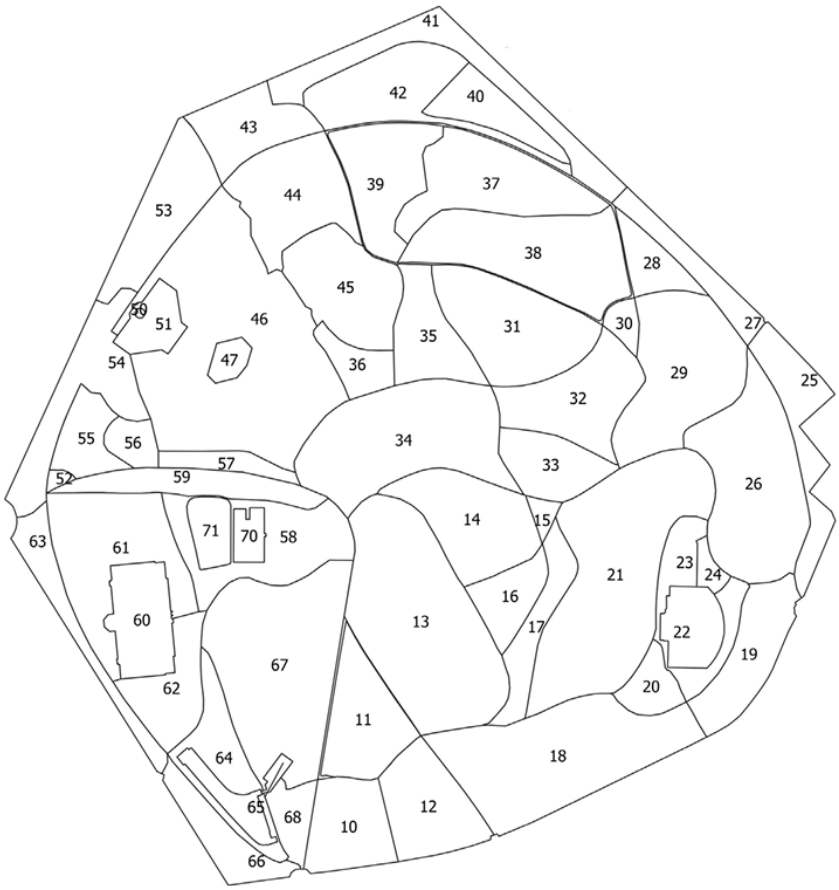

Figure 2. Division of the domain of Meise Botanic Garden into sectors. These divisions were used in the period 2011-2019 to process the data. Some recent adjustments of the boundaries have been ignored.

Results

› *Amorpha fruticosa* Nutt. (Fabaceae)

The genus *Amorpha* is native to the United States and northern Mexico, but has been introduced into dozens of countries across Europe and Asia, as well as parts of South America, including Uruguay and northern Argentina (POWO). The genus comprises 16 species characterized by small flowers with a reduced corolla consisting of a single petal, which makes species-level identification particularly challenging.

The most widespread species is *Amorpha fruticosa*, native to northwestern Mexico and 21 U.S. states, and introduced in nearly all regions where the genus is present (POWO, accessed 12 February 2025). This species primarily inhabits desert and dry shrubland biomes, and its native range overlaps with that of all other *Amorpha* species, most of which have more restricted distributions (e.g., Isely 1998; Straub 2010; Flora of the Southeastern United States, 2024 edition).

In the Meise Botanic Garden (MBG), 18 accessions representing ten putative species of *Amorpha* are under cultivation (Botanical Collections, accessed 19 March 2025). However, based on taxonomic updates in POWO (POWO, accessed 10 February 2025), several of these names are now considered synonyms, reducing the number of distinct species to seven: *A. californica*, *A. canescens*, *A. fruticosa* (partly listed as *A. croceolanata*), *A. glabra*, *A. herbacea* (partly listed as *A. cyanostachya*), *A. nana*, and *A. paniculata*. In addition, *A. tomentosa* is cultivated, which is an unplaced species.

Escapes of *Amorpha* species have been recorded on several occasions within the garden. These typically involve seedlings emerging in close proximity to the cultivated parent plants, often in large numbers. For example, numerous seedlings of *A. californica* were found in 2010 at distances of 3–5 meters from the cultivated plants in the Dahlgren Arboretum (Ronse 2011b), with similar observations repeated in July 2013. However, a recent critical review of the cultivated mother plants named *A. californica* showed them to be actually *A. fruticosa*.

This is the most frequently cultivated species in the garden, with four accessions recorded, though none of known wild origin. Several other escape events were observed for this species, for example in the long border east of the Plant Palace, where many seedlings were observed under *A. nana* plants: approximately thirty in October 2012 and hundreds of saplings up to 25 cm tall in July 2015.

While most of these seedlings were ephemeral—occurring in intensively managed and frequently weeded areas—a few individuals have successfully established beyond the immediate vicinity of cultivated beds. Since 2013, several larger plants have been recorded in Sector 13 around the Castle Lake. In October 2015, flowering specimens confirmed their identity as *A. fruticosa*. As of September 2025, at least two mature individuals, up to 3 meters tall, remained present in that area.

In Belgium, *Amorpha fruticosa* was first recorded in the wild in 1953, when it was found on uncultivated land in Antwerp (Verloove 2006; Botanical Collections, accessed 2 July 2025). Notably, all early wild occurrences of the species were located in and around Antwerp, although these are doubtfully linked to the initial 1950s introduction. In 2002, a clonal stand was discovered on the abandoned quays along the River Scheldt, and from 2005 onwards, multiple shrubs were found growing among the basalt boulders along the riverbank at Antwerp–Linkeroever. Elsewhere on Linkeroever, where the species has also been planted, *A. fruti-*

cosa has frequently been found as a casual or naturalized escape (numerous collections by the second author; Botanical Collections, accessed 2 July 2025). According to recent observations on Waarnemingen.be (accessed 2 July 2025), the species continues to be reported in this area, suggesting its local naturalization. Since 2011, small but persistent populations have been recorded at two sites in the Ghent port area: alongside a guardrail along Kennedylaan and at the southwestern edge of the Petroleum Dock. In 2014, a large clonal patch was also found on a railway embankment in Kortrijk (pers. obs. and collections FV). Since then, *A. fruticosa* has been observed at numerous sites across both Flanders and Wallonia. In the early 2000s, the species was still regarded as strictly ephemeral in Flanders (Verloove 2002), but this is clearly no longer the case. Of potential concern is its occurrence in (semi-) natural plant communities along major rivers, such as the Scheldt near Antwerp and the Meuse (Maas) in the province of Limburg, where it has been recorded since 2016 (Verloove 2023).

Herbarium: A. Ronse 2939, Meise Botanic Garden, s 13, 24.09.2013; A. Ronse 3843, Meise, domain of Botanic Garden, s 13, edge of lake, one plant, flowering, 12.10.2015; A. Ronse 3784, Botanic Garden Meise, s 63, hundreds of seedlings under mother plant, 21.08.2015; A. Ronse 6057, Meise, Botanic Garden, s 63, in border, cultivated since 1958, flowering bush of ca 1,8 m high, short inflorescences 2-2,5 cm, 03.09.2024; A. Ronse 6145, Meise, Botanic Garden, s 13, around castle lake, 2 bushes 2,5-3 m high, stipules 5 mm long, leaf rachis flattened, 11.09.2024; A. Ronse 6412, Meise, Botanic Garden, s 46, Dahlgren Arboretum, cultivated as *A. californica*, 26.06.2025 (det. F. Verloove, 07.2025).

› *Aquilegia vulgaris* L. (Ranunculaceae) (Fig. 3)

This species is native to most parts of Europe, except Scandinavia, but has been introduced in northern and eastern regions such as Scandinavia, Switzerland, and Russia, as well as in parts of North and South-America, Asia, Australia and New Zealand (POWO, accessed 14 May 2024). It typically occurs in the temperate to cold biomes. Although many naturalized occurrences worldwide are recorded under the name *A. vulgaris*, it is likely that a significant proportion of these represent garden hybrids or cultivars rather than wild-type plants. In particular, cultivated forms often display double flowers or other ornamental traits not found in wild populations.

In the MBG, *A. vulgaris* is cultivated in the Cronquist Garden, from seed obtained in 1972 from a Czech botanical garden (Tabor H.B.), as well as near the castle, with material obtained from the Botanical Garden of Potsdam (Germany) in 1970.

Escapes have been recorded on several occasions across different sectors of the garden, with seedlings and flowering individuals recorded at distances of over 100 metres from the sites of cultivation. For example, individuals were found in sector 53 on 19 August 2010, and several flowering plants were still present there in 2024. This area is known to host several other escaped species from the Cronquist Garden, such as *Oenanthe pimpinelloides* (Ronse 2005), *Camassia leichtlinii*, *Clematis recta*, *Crocus tommasinianus* and *Muscari comosum* (see further in this contribution). The presence of a garden shed and a designated area for wheelbarrows with trimmings and plant debris from the adjacent Cronquist Garden may explain the local concentration of escaped species. It is plausible that seeds, bulbs, or plant fragments were inadvertently introduced to the area and subsequently established. Moreover, *A. vulgaris* has been observed repeatedly in the Castle Farm Borders (sector 58) in 2016 and in 2018, probably escaped from the German accession cultivated nearby.

Although *A. vulgaris* is native to Belgium, it is not indigenous to Flanders. In that region, occurrences in the wild represent either escapes from cultivation or deliberate introductions. Spontaneous seedlings had already been documented by Ronse (2011b) within the Cronquist Garden as well as in the medicinal garden of MBG, where the species is also cultivated. In all locations in MBG, the escapes most likely derive from plants cultivated in botanical gardens but without known wild origin. It is, however, well possible that these came from genetically wild material rather than from horticultural stock. Indeed, in the seventies, the wild or cultivated provenance of the accessions in botanic gardens was mostly not recorded.

Herbarium: A. Ronse 5900, Meise Botanic Garden, s 54, in woody areas, half shade, 3 flowering plants, 08.05.2024.

Figure 3. Self-sown *Aquilegia vulgaris* in woody areas of the garden.

› *Berberis julianae* C.K.Schneid. (Berberidaceae) (Fig. 4)

The native range of this shrub is restricted to central China (from Chongqing to southeastern Shaanxi). It has been introduced in several parts of Europe, including the former Czechoslovakia, Great Britain, Ireland, and Romania, as well as in the the United States (Alabama, Maryland, New York) (POWO, accessed 5 April 2024). In the USA, an *Invasive Plant Alert* has been issued to warn about the species' invasive potential (Speith & Frey 2012). It is also listed as invasive or potentially invasive in South Africa, where it is subject to active management measures (Keet *et al*. 2016).

In the MBG, three accessions of *B. julianae* are currently cultivated. Two are planted in the Dahlgren Arboretum (sector 46), and one in sector 58 near the ancient castle farm. The latter is an old accession of unknown provenance, already present in Meise before the collections were transferred from Brussels around 1930. Additionally, two accessions previously labelled as *B. julianae* in this sector have since been reidentified as *Berberis* aff. *julianae*. A fourth, now-dead accession was formerly present in sector 61, but has been recorded as lost since 1993.

In the Dahlgren Arboretum, several *Berberis* species, including *B. julianae*, have been observed germinating in large numbers in the immediate vicinity of cultivated individuals. These seedlings are typically removed by horticultural staff before they can mature. Nevertheless, spontaneous individuals of *B. julianae* have repeatedly been found throughout the domain, in locations far removed from cultivated specimens. These plants likely originate from bird-dispersed seeds, given the species' attractive and fleshy berries. In 2014, a sapling was found in the Conifers collection (for-

merly called Coniferetum; sector 54). In the same year and again in 2016, large, presumably older individuals were discovered in a woodland area at the westernmost boundary of the domain (sector 41). A particularly large individual grows atop the so-called English bridge in sector 61, a grotto and bridge complex believed to have been constructed around 1805-1810, when this part of the domain was redesigned as an English landscape garden, probably by François Verly (Vidts & Deneef 2011). Additional juvenile plants have been observed on the slope below this bridge (herb. A. *Ronse* 4585). None of these occurrences in sectors 41 and 61 are recorded in the collections database. In sector 58, two spontaneous shrubs measuring between 0.5 and 1 m in height have been present since 2018. They are situated at the bases of cultivated trees and are most likely derived from a nearby cultivated accession (number 10003799), located 60 and 110 m away, respectively. This accession also lacks documented provenance.

Although once confined to gardens, *Berberis julianae* is increasingly encountered in natural or semi-natural habitats in Belgium. Subspontaneous individuals have been recorded in areas surrounding the MBG (e.g., Grimbergen; Ronse 2024) as well as further afield.

The species is clearly naturalizing, with some populations persisting for over 20 years, such as in Roeselare. The ongoing spread and persistence of *B. julianae* in Belgium are documented in detail at Alien Plants of Belgium and Waarnemingen.be.

Herbarium: A. Ronse 3077, Meise Botanic Garden, s 41, 1 (probably) planted, 13.03.2014; A. Ronse 3377, Meise Botanic Garden, s 54, 15.09.2014; A. Ronse 4153, Meise Botanic Garden, s 41, 1 large plant (cultivated?), 16.09.2016; A. Ronse 4506, Meise Botanic Garden, s 58, cultivated, 11.12.2018; A. Ronse 4508, Meise Botanic Garden, s 58, cultivated, 11.12.2018 (as aff. *julianae*); A. Ronse 4641, Meise Botanic Garden, s 67, between roots of tree, near stem, one seedling, 06.12.2018; A. Ronse 4585, Meise Botanic Garden, s 61, atop the English bridge, 20.02.2019; A. Ronse 5657, Meise APM, s 67, along stem of old tree, spontaneously grown, 15.03.2024; A. Ronse 5898, Meise Botanic Garden, s 58, atop the English bridge, planted (without n°?), 08.05.2024; A. Ronse 6236, Meise Botanic Garden, against stem of *Aesculus* tree, spontaneous, +/- small plant, some warts (only few, dark red), 04.04.2025; A. Ronse 6238, Meise Botanic Garden, s 58, cultivated n° 1000-...3799, flowering and fruiting, 04.04.2025; A. Ronse 6277, Meise Botanic Garden, on top of sector 58/61, large bush, fruiting, 18.04.2025.

Figure 4. (←) Self-sown plant of *Berberis julianae* growing against the stem of old *Aesculus*.

Figure 4. (→) Detail of a cultivated plant, that is probably the source of the self-sown plants.

› *Camassia leichtlinii* (Baker) S. Watson subsp. *leichtlinii* (Asparagaceae) (Fig. 5)

According to POWO (accessed 14 May 2024), *Camassia leichtlinii* is a bulbous geophyte with two recognized subspecies, subsp. *leichtlinii*, which is native to Oregon, specifically the area around Roseburg, and subsp. *suksdorfii*, with a wider native range from southern British Columbia to central California. While both subspecies are described and pictured with violet-blue flowers in POWO, the Pacific Bulb Society (accessed 14 May 2024) provides further clarification: subsp. *leichtlinii* typically bears pale creamy-yellow to white flowers, whereas subsp. *suksdorfii* produces darker violet-blue flowers.

This website also notes that subsp. *leichtlinii* can behave aggressively under favorable conditions. In the words of contributor R. Whitlock: "A pest in a favorable climate, almost as bad as bluebells (*Hyacinthoides non-scripta*). Every seed germinates and the bulbs bury themselves so deeply as to be very difficult to dig up. Fortunately, they do not form offsets." Despite this potential for persistence and spread, POWO does not report *Camassia leichtlinii* as naturalized anywhere outside its native range. No additional global naturalization records could be found in the consulted literature or online floras. However, localized subspontaneous occurrences have recently been reported in Belgium.

The oldest accession of this species in the MBG was obtained in 1970 from the Botanical Garden of Potsdam (Germany) and planted in both the Cronquist Garden and the Orangery Garden. A more recent white-flowered accession from a Belgian grower was planted in 2018 in the Entrance Garden of the new Plant Palace. Given the geographic distance and relatively recent introduction, this latter accession is unlikely to be the source of the escaped plants. In contrast, several spontaneous plants—some flowering—have been observed since 2020 in a wooded edge of sector 53, at distances over 100 m from the Cronquist Garden. By 2024, several dozen individuals had been recorded, many in full bloom and all showing creamy-white flowers. These observations strongly suggest subsp. *leichtlinii* as the source. Moreover, this population appears to originate from seed: the web page for this accession in the Botanical Collections database (accessed 3 April 2025) explicitly mentions "open pollination" and includes an image of seeds.

In addition to this expansion, the species has become dominant in flower beds of the Cronquist Garden itself, where it has outcompeted and largely replaced several other geophytes, including *Camassia quamash*, *Ornithogalum* spp., and *Hyacinthoides* spp. Its dense growth leaves little room for other plants. In March 2021, two non-flowering individuals were also spotted under trees in an adjacent part of the Dahlgren Arboretum, but these were swiftly removed by horticultural staff.

The number of *C. leichtlinii* observations in Belgium has significantly increased in recent years, as documented on Waarnemingen.be (accessed 24 March 2024). However, the majority of these sightings appear to concern cultivated plants, typically in urban green spaces or along roadsides. This is especially clear where *C. leichtlinii* occurs alongside other ornamental bulb species such as *Narcissus*. Field verifications by A. Ronse in Londerzeel (herbarium vouchers 5822 and 5824) confirmed such cultivated origins.

Probably all occurrences result from discarded bulbs or garden waste, there is no evidence of spontaneous establishment from seed. The 2013 observation by the second author in Kortrijk, where *C. leichtlinii* was found alongside *Leucojum aestivum* and

Eranthis at what was likely a garden waste dumping site, fits this pattern, as it also involved discarded plant material rather than true escape from cultivation (Waarnemingen.be).

Interestingly, all *C. leichtlinii* records currently documented on waarnemingen.be concern the blue-flowered form, typically assumed to represent subsp. *suksdorfii*. Although the white-flowered subsp. *leichtlinii* is listed in the database, it has not (yet) been the subject of confirmed observations in the wild. This may reflect underreporting, limited tendency to escape from cultivation, or simply lower horticultural prevalence of this subspecies.

Herbarium: A. Ronse 4933, Meise Botanic Garden, Coniferetum s 53, forest understory, several plants, not flowering yet, 17.03.2021.

Figure 5. *Camassia leichtlinii* subsp. *leichtlinii* flowering in a forest edge in sector 53.

› *Chamaemelum nobile* (L.) All. (Asteraceae)

According to POWO (accessed 10 April 2024), *Chamaemelum nobile* is native to a broad Mediterranean-Atlantic region, including Algeria, France, Great Britain, Ireland, Morocco, Portugal (including Madeira and the Azores), and Spain. It has been introduced to numerous regions worldwide, such as Albania, Austria, the Baltic States, Belarus, Belgium, Bulgaria, Colombia, former Czechoslovakia, Germany, Haiti, Italy, Pakistan, Poland, Russia, South Australia, Switzerland, Ukraine and Crimea, the United States, and former Yugoslavia. Despite this wide cultivated and introduced range, additional modern data on its naturalized or weedy behavior remains scarce and scattered. The species is often cultivated as a medicinal or ornamental herb, but only rarely becomes persistent in non-cultivated settings.

At the MBG, *Chamaemelum nobile* is cultivated both in the Cronquist Garden and the Medicinal Garden, under the name of its synonym *Anthemis nobilis* L.. The current accession originates from a wild collection made in Hesse (Germany) and was provided by HB Krefeld in 1980.

Escapes of *Chamaemelum nobile* were found in laws in different parts of the garden. The species was first observed subspontaneously in 2010 in the lawns of the Dahlgren Arboretum, and subsequently in 2014 in sector 54. Both locations lie close to the Cronquist Garden and the Medicinal Garden. By 2017–2018, the species had spread significantly further: in 2017 close to the Plant Palace (sector 60), and in 2018 around the Orangery Lake (sector 21), as well as in different parts of sector 67, more than 600 meters from cultivated sources. At most of these locations, the plants formed dense mats of creeping, non-flowering individuals in lawns. Flowering was occasionally observed when mowing was less frequent, such as during the dry summer of 2018, when a few individuals managed to flower in sector 21. Some earlier, misidentified records may have been confused with *Anthemis arvensis*, a morphologically similar species already noted as an escape in MBG by Ronse (2011b). Nevertheless, none of these populations appear to have persisted over the long term; all observed occurrences seem to have disappeared after a few years.

Historically, *C. nobile* has occasionally been found as a casual alien in Belgium. According to Verloove (2006), the species was noted several times during the 19th century and was last recorded in 1985 before becoming largely absent from the flora. A recent and notable exception was recorded in 2020 in Antwerp, where a substantial population (estimated at over 100 plants) was discovered by Dirk De Beer in a lawn setting (Waarnemingen.be). Remarkably, this population was still present in 2025, suggesting a certain degree of persistence. Similar to the cases in MBG, this appears to involve spontaneous growth in short-cut lawns, but not necessarily long-term naturalization.

Herbarium: A. Ronse 4458, Meise Botanic Garden, s 67, in the lawn, flowering within dry lawn, 31.07.2018; A. Ronse 4460, Meise Botanic Garden, s 67, next to herbarium building, several square meters in two patches, 01.08.2018.

› *Clematis recta* L. (Ranunculaceae) (Fig. 6)

According to POWO (accessed 6 September 2024), *Clematis recta* is native to southern and eastern Europe, extending eastward to the Caucasus. It is reported as introduced in Belgium, Scandinavia, and parts of North America (notably New York and Ontario).

In the MBG, *C. recta* is cultivated in the Cronquist Garden. The accession originates from the former botanical garden in Brussels and was transferred to Meise in 1963. Additionally, two accessions labelled *C. recta* var. *mandshurica* were planted in the collections. One of these was received in 1967 from Geisenheim BG (Germany), and is planted in part of the Dahlgren Arboretum, less than 100 m from the plants in the Cronquist Garden. According to POWO (accessed 6 September 2024), the latter variety is a synonym of *Clematis terniflora* var. *mandshurica* (Rupr.) Ohwi, a taxon native to East Asia (parts of Russia, Mongolia, Korea, and China). This taxonomic clarification may complicate identification of spontaneous plants occurring near both accessions.

On 8 April 2016, several young plants of *Clematis* were observed in the Cronquist Garden in close proximity to the cultivated *Clematis recta*. Moreover, in 2020 a larger but non-flowering plant was found along a path between sectors 53 and 54, about 90 m away from the population in the Cronquist Garden. Given their location, these spontaneous plants may derive from either *C. recta* or *C. terniflora* var. *mandshurica*, though precise identification remains unresolved. Previously, *Clematis vitalba* — the native species — was reported in MBG by Ronse (2011a), specifically in sector 53. However, in light of more recent observations and potential confusion between taxa, it is not excluded that some earlier records attributed to *C. vitalba* may actually refer to *C. recta*.

Historically, *Clematis recta* was considered locally naturalized in Belgium, although its status has since been revised. According to Alien Plants of Belgium, the species was formerly listed as naturalized but is now regarded as extinct in the wild. The last

confirmed subspontaneous occurrences appear to date back to the early 20th century, and no recent naturalized populations are known.

Modern observations of the species in Belgium, such as those listed on Waarnemingen.be, almost exclusively concern cultivated plants in gardens or immediate surroundings. There is no strong evidence for persistent wild populations or recent in situ establishment outside of cultivation.

Herbarium: A. Ronse 4860, Meise Botanic Garden, s 53, 07.05.2020.

Figure 6. Subspontaneous plant of *Clematis recta* growing in a hedge in sector 54 (May 2020).

› *Crocus flavus* Weston (Iridaceae) (syn.: *C. aureus*, *C. maesiacus*) (Fig. 7)

Crocus flavus is a yellow flowering species native to the Balkans and western Turkey (the Pacific Bulb Society and POWO, accessed 18 March and 25 March 2024 respectively). According to POWO, the species is introduced in former Czechoslovakia and in at least two U.S. states, including Arkansas, where its occurrence was documented by Serviss *et al*. (2016).

A species that may be confused with *C. flavus* is *C. chrysanthus*, another yellow-flowering *Crocus*, which differs by having a corm tunic with a pronounced long neck—absent in *C. flavus*. Although *C. flavus* is not recorded from the wild in the British Isles, *C. chrysanthus* was found naturalized in Surrey in 1983 and seems to be increasing in occurrence (see BRC Plant Atlas, accessed 18 February 2022).

In the MBG, two accessions of *C. flavus* are present in the living collections. One accession, originating from BG Wuppertal (Germany), was obtained in 1967 and planted both in the Cronquist Garden and in sector 58. A second accession was received from HB Sofia (Bulgaria) and was planted in and around the Orangery Garden, on the opposite side of the garden domain.

In February 2022, two yellow-flowering *Crocus* individuals were observed in sector 54, amidst a larger population of subspontaneous blue-flowering *C. tommasinianus* (see further). The flowers had slender, pure yellow petals. One of the plants was collected and deposited in the herbarium. The diagnostic absence of a tunic neck on the corm confirmed identification as *C. flavus* rather than *C. chrysanthus*. Given their proximity to the Cronquist Garden, the plants likely originated from the 1967 German accession. No additional yellow-flowering *Crocus* were recorded at this site in 2024 or 2025. However, the presence of vegetative individuals cannot be ruled out, since many naturalized *Crocus* plants fail to flower regularly, as noted in repeated observations in MBG.

There are no confirmed cases of naturalized *Crocus flavus* in Belgium. The Alien Plants of Belgium website lists no records for this species as an escape from cultivation. This is in contrast with *C. chrysanthus*, which has reportedly become naturalized in several countries and is occasionally confused with *C. flavus*. Similarly, waarnemingen.be (accessed July 2025) does not include any observations of *C. flavus*. The individuals recorded in the MBG in 2022 therefore likely represent a rare case of short-term escape without evident persistence.

Herbarium: A. Ronse 5183, Meise Botanic Garden, s 54, undergrowth of trees, only two flowering plants, remote from each other, 17.02.2022.

Figure 7. A few yellow-flowering *Crocus flavus* were found among purple *C. tommasinianus* in 2024 (←); Flower of *C. flavus* (→).

› *Crocus tommasinianus* Herb. (Iridaceae) (Fig. 8, 9, 10)

Crocus tommasinianus, a lilac- to purple-flowering crocus, is native to parts of southeastern Europe, specifically the Balkans, former Yugoslavia and Hungary (POWO, accessed 9 September 2024). The Pacific Bulb Society offers a more detailed distribution, listing Croatia, Serbia, Bosnia, Montenegro, Bulgaria, and Hungary, where it grows in open woods and shady hillsides. The species has been cultivated in Britain since 1847 and was first recorded from the wild there in 1963. Due to past confusion with *C. vernus*, however, it is difficult to trace historical changes in its distribution. Nevertheless, its popularity in horticulture, ease of cultivation, and tendency to self-seed suggest that it may be increasing in the wild (see BRC Plant Atlas, accessed 18 February 2022). Outside of Europe, *C. tommasinianus* is also occasionally naturalized in the United States. For instance, it is documented as locally naturalized in parts of northeastern U.S., particularly in old garden areas, cemeteries, and parks (e.g. Missouri Botanical Garden, USDA PLANTS database). In many cases, long-term survival is attributed to vegetative persistence and limited sexual reproduction.

In the MBG, *C. tommasinianus* has been cultivated in the Cronquist Garden since 1971, based on plants obtained from Neuchâtel Botanic Garden (Switzerland; accession 19711255). This accession was grown alongside various other *Crocus* species, although by 2024, *C. tommasinianus* remained the sole surviving spring-flowering *Crocus* in the Cronquist Garden, spreading also into adjacent beds formerly occupied by other *Crocus* taxa.

In 2004 and 2007, cultivars of the species were additionally planted in sectors 66 and 67, near the main garden entrance, using bulbs from Dutch commercial growers.

From at least 2000 onward, spontaneous populations have developed in forested areas of sectors 54 and 53. These areas now host hundreds of flowering individuals, presumably derived from

the 1971 accession. This accession was propagated through open pollination, and spontaneous seed production is documented in both wild and cultivated plants. Notably, accession number 10003495—present in the Cronquist Garden and in sector 54—originated from such seedlings. The probable mechanism of escape involves seed dispersal from overblown flowers in the Cronquist Garden. These seeds may have germinated in trimmings and plant debris temporarily stored in the nearby woodland zones before being composted. Seed capsules observed on both escaped and cultivated plants (e.g. May 2020) support this hypothesis.

Since 2020, the self-sown population has been expanding steadily, covering approximately 500 m in 2024 across sectors 53 and 54. More recently, individuals have been observed in adjacent sectors 59 and 63, confirming an ongoing expansion.

The situation of *Crocus tommasinianus* in Belgium remains ambiguous. While the species is very frequently observed in gardens and parks—and widely reported on Waarnemingen.be—most records likely represent planted specimens or garden escapes. Several issues complicate assessment of its naturalization status:

1. **Identification challenges**: The species is often confused with *C. vernus*, the more familiar and widespread "stinzenplant" in Belgium.
2. **Persistence vs. naturalisation**: While long-lived populations are known (e.g. in estate parks and older gardens), these may reflect long-term survival rather than true establishment or spread in the wild.
3. **Lack of robust data**: No published records confirm full naturalization of *C. tommasinianus* in Belgium (see also Alien Plants of Belgium). The species is absent from the list of fully naturalized crocuses.

Herbarium: A. Ronse 4926, Meise Botanic Garden, s 53/54, under trees, >1000 plants escaped from Herbetum, 04.02.2021; A. Ronse 5166, Meise Botanic Garden, s 54, wood margin, hundreds of individuals, 24.01.2022; A. Ronse 5182, Meise Botanic Garden, s 54, undergrowth of forest and edge, many hundreds-thousands, increasing, 17.02.2022.

Figure 8. Flowering plant of *Crocus tommasinianus* (17 February 2022).

Figure 10. Seed pods were present on many subspontaneous plants of *Crocus tommasinianus* in sectors 53/54 (May 2020)

Figure 9. Flowering *Crocus tommasinianus* in sector 54 in the 1980s.

› *Cyclamen coum* Mill. (Primulaceae) (Fig. 11, 12)

Cyclamen coum is a low-growing tuberous herbaceous perennial native to a region spanning from eastern Bulgaria to the Caucasus and Israel. The species includes two recognized subspecies: *C. coum* subsp. *coum* and *C. coum* subsp. *caucasicum* (K.Koch) O.Schwarz. According to POWO (accessed 26 March 2024), *C. coum* subsp. *coum* is also introduced in Belgium, France, Germany, Great Britain, and Romania.

The species thrives in shaded to semi-shaded environments, forming attractive carpets of rounded to heart-shaped leaves, often beautifully silver-variegated on the upper surface. Flowers appear in winter, typically in February, ranging from deep pink to pale pink or nearly white.

Various accessions of *C. coum* have been introduced into MBG over the past decades. In 1966, plants of subsp. *caucasicum* were obtained from a Swiss botanic garden and planted in and around the Orangery Garden and in the Castle Farm borders (sector 58). In 1978, subsp. *coum* was planted near the Meise entrance using material from the Vienna Botanic Garden. In 1983, additional corms from commercial sources were added near the Orangery. In 2004, three accessions from a Belgian botanic garden were planted under *Hamamelis* in sector 63. These have since expanded both spontaneously and through deliberate propagation using locally collected seeds. In 2014 and 2018, further accessions were planted in sectors 10 and 63, including the white-flowered cultivar 'Album'. These introductions have resulted in a number of flourishing populations, particularly in the Winter Garden (sector 63), with an impressive diversity of flower colors and leaf patterns (fig. 12).

Since a few years, *C. coum* has begun to escape from cultivation in the garden. Observations were mostly made during the flowering season (February–March), as non-flowering individuals are inconspicuous. In 2022, one flowering plant was observed in a shaded lawn behind the Plant Palace (sector 59), about 35 m from the cultivated population in sector 63. In 2023, this population had expanded significantly, with an estimated 50–100 individuals spread over roughly 60 m². By 2024, this same area contained at least 18 flowering and numerous non-flowering plants across over 1000 m². Additional spontaneous groups were recorded in sector 54, where five flowering individuals were found 35 m from the nearest cultivated plants. In sector 66, a new site was discovered near the staff entrance. These plants likely originated from the 1978 accession planted near the main entrance (Vlaamse hoeve), about 90 m away. These findings suggest that *C. coum* is able to naturalize locally within the MBG under favorable conditions, particularly in shaded lawns and woodland edges. Its spread appears to occur via seed, possibly assisted by ants (myrmecochory), a mechanism known in the genus *Cyclamen*.

The status of *Cyclamen coum* elsewhere in Belgium remains somewhat unclear. The species is increasingly popular in both private and public gardens, and its use in landscaping has surged in recent years. This popularity has led to a growing number of reports on Waarnemingen.be, but many of these likely refer to cultivated or recently planted individuals.

Confirmed instances of *C. coum* becoming naturalized are limited, although isolated populations may persist in woodlands near residences or as relics of older plantings in estate parks and castle domains. These could result from discarded tubers or deliberate plantings, with subsequent limited natural spread.

Two important factors complicate assessments of its naturalization: 1) Identification difficulties: Several *Cyclamen* species are cultivated in Belgium, and *C. coum* is not always easily distinguished from *C. hederifolium* or other species, especially outside the flowering period; 2) Lack of documentation: Despite frequent garden use, there is little published evidence of fully naturalized populations in the wild. The Alien Plants of Belgium website reports a few locations where the species appears to be naturalized.

Figure 11. Subspontaneous plants of *Cyclamen coum* in a shaded lawn in sector 59.

Figure 12. Display of cultivated *Cyclamen coum* in the Winter Garden (March 2024).

› *Cyclamen hederifolium* Aiton (Primulaceae) (Fig. 13)

This species comprises two subspecies: *Cyclamen hederifolium* subsp. *hederifolium*, native to Albania, Bulgaria, the East Aegean Islands, France, Greece, Italy, Switzerland, Turkey, and the former Yugoslavia, and introduced in several other regions including Belgium, Germany, Great Britain, Ireland, and Oregon (USA); and subsp. *crassifolium*, which is restricted to Greece (POWO, accessed 27 March 2024). Commonly known as ivy-leaved cyclamen or sowbread, this species is a low-growing, tuberous perennial. Its foliage ranges from heart-shaped to narrowly arrow-shaped leaves, typically with 2–3 angled lobes on each side—mimicking the juvenile foliage of ivy, which explains its English vernacular name. Leaf coloration is variable, from entirely green to entirely silver, though the most frequent pattern is a hastate or marbled design in pewter or silver with green tones (Wikipedia, accessed 27 March 2024).

The species can be reliably distinguished from *Cyclamen coum* in vegetative state by its larger and more deeply lobed leaves, and by its phenology: *C. hederifolium* flowers in late summer to early autumn, whereas *C. coum* blooms from late winter to early spring.

At Meise Botanic Garden, *C. hederifolium* has been cultivated in multiple locations, most prominently in and around the Orang-

ery Garden. Plantings include wild-sourced material from Turkey introduced in 1987, the cultivar 'Album' introduced in 1990, and a wild-collected accession from Palermo (Sicily) added in 1998. In 2015, additional corms from a commercial Dutch source were planted, not only in the Orangery Garden but also near the castle farm (sector 58), in the Cronquist Garden, and along the edge of sector 54.

A large clump of naturalized plants has been observed for several years in sector 54, flowering within a border of *Erica carnea* 'King George' along the Ring Road. These plants are located approximately 90 m from the nearest cultivated individuals and likely represent spontaneous establishment from earlier plantings.

In Belgium, *C. hederifolium* is not currently considered fully naturalized, but sporadic escapes and localized persistence have been documented. According to Alien Plants of Belgium, the species is frequently cultivated and widely planted in both public and private gardens. Observations of wild-growing individuals are most often associated with garden waste disposal or seed dispersal from nearby cultivated sources.

Numerous observations are listed on Waarnemingen.be, but most refer to plants in managed or semi-managed settings. Nevertheless, the species appears capable of forming locally persistent populations, especially in shaded and undisturbed habitats such as small woodland remnants or the understory of ornamental plantings near former estates.

As with *C. coum*, the exact extent of establishment is difficult to assess due to potential misidentification and the long-lived nature of tubers in suitable conditions. Its capacity to set seed, combined with high horticultural popularity, suggests that further spread is possible, though current evidence does not support widespread naturalization in fully natural habitats.

Figure 13. *Cyclamen hederifolium* flowering between planted *Erica carnea* (October 2024).

› *Muscari armeniacum* H.J.Veitch (Asparagaceae) (Fig. 14)

Muscari armeniacum is a bulbous geophyte native to Bulgaria, Greece, the North Caucasus, Transcaucasia, Turkey, and the former Yugoslavia. It is widely introduced in Western Europe, including Belgium, as well as in Austria, the former Czechoslovakia, the Falkland Islands, parts of Australia and New Zealand, and in the United States (POWO, accessed 9 September 2024).

In the MBG, the species has been cultivated in several locations, mostly in the northern parts of the domain, such as in sectors 19, 20 (the Flower Theatre) and 22 (presently the Culinary Garden).

In MBG, spontaneous occurrences of the species have been documented on at least two occasions. The first was in May 2021, when several flowering individuals were observed in the Cronquist Garden, among plant beds containing other *Muscari* species. A second observation was made in April 2024, when a few flowering plants were found growing freely among disused greenhouses within the Plant Palace complex.

In Belgium more broadly, *M. armeniacum* has long been the most frequently planted species of *Muscari* in both private gardens and public plantings. Due to its vigorous vegetative reproduction, surplus bulbs are often discarded with garden waste, frequently resulting in spontaneous establishment along roadsides, garden edges, or woodland margins near human habitation. In recent years, the species appears to be increasingly naturalized in such disturbed or semi-natural environments.

Herbarium: A. Ronse 5728, Meise Botanic Garden, spontaneously growing between empty greenhouses of Plant Palace, leaves up to 5 mm wide, longer than inflorescences, +/- pale green, 08.04.2024.

Figure 14. *Muscari armeniacum* flowering between empty greenhouses of the Plant Palace, April 2024 (←); the leaves are longer than the inflorescence (→); detail of flowers (↓).

› *Muscari azureum* Fenzl (Asparagaceae) (Fig. 15)

Muscari azureum, commonly known as azure grape hyacinth, is native to northern and eastern Turkey, where it grows in alpine meadows (Mathew 1987; Schauenberg 1965). Outside its native range, the species has been introduced in Austria, the former Czechoslovakia and Germany (POWO, accessed 10 September 2024).

In the MBG, three accessions have been cultivated. The earliest, introduced in 1971 from the Horticultural and Botanical Garden of Cluj-Napoca (Romania), was planted in the Cronquist Garden. Two additional accessions from German botanical gardens were planted in the historic Orangery Garden. However, the latter two accessions disappeared in 2022 when the Orangery Garden underwent complete redesign and was transformed into the Culinary Garden. The population in the Cronquist Garden has gradually declined as well, and by 2023, only three inflorescences remained.

Subspontaneous growth of *M. azureum* was first observed in March 2021 under an old *Castanea* tree on a slope in sector 53. This small population has persisted and flowered annually since then, producing between 8 and 15 inflorescences per year. Although at first sight it appeared to be a single plant, the group comprises several individuals forming a loose clump. Each plant is 4–15 cm tall, with two to three grey-green leaves per bulb, and bears a dense raceme of up to 60 bright blue flowers (Wikipedia, accessed 10 September 2024). In 2025, two young individuals were recorded 25–30 cm from the main clump, one of which was flowering, suggesting successful sexual reproduction and seedling establishment.

The escaped population likely originated from the accession in the Cronquist Garden, situated approximately 160 m downslope. The fact that the spontaneous plants occur on higher ground may suggest dispersal by a biotic vector such as birds or small mammals.

In Belgium, *Muscari azureum* is a very rare escape from cultivation and is not listed in Verloove (2006). It has recently been reported near Durnal, where a small population was first discovered in 2019 and confirmed in 2021 (Waarnemingen.be). It remains uncertain whether these plants represent a truly naturalized population or are relics of a former garden planting.

Figure 15. A clump of *Muscari azureum* in a woody area of sector 54.

› *Muscari comosum* (L.) Mill. (Asparagaceae) (Fig. 16)

Muscari comosum, commonly referred to as tassel hyacinth or tassel grape hyacinth, is a bulbous geophyte primarily associated with the temperate biome. Its native distribution ranges from the Canary Islands to Central Europe and Iran, encompassing most of southern, western, and eastern Europe, but excluding the British Isles, Belgium, the Netherlands, and Scandinavia. It is considered introduced in Belgium, Denmark, Great Britain, The Netherlands, Poland, South Australia and parts of the United States (POWO, accessed 9 April 2024). In its native range, it typically grows in rocky soils and disturbed areas, such as cornfields and vineyards in the Mediterranean area. It naturalizes easily and may become invasive, with northward expansion from its original distribution having already occurred in parts of Europe as early as the 16th century, including in the British Isles (Wikipedia, accessed 1 March 2024).

At the MBG, the species is grown in the Cronquist Garden since 1967, originating from an accession of unknown wild provenance from the Botanical Garden of Trieste (Italy). Additionally, a horticultural form, *M. comosum* 'Plumosum' (also known as feather hyacinth), with characteristically modified, plume-like inflorescences, has been planted in sector 21 at the opposite side of the domain, using material from a Dutch commercial source.

Since 2021, several plants of *M. comosum* have been found subspontaneously in shaded lawns and under trees in sector 54. The species has continued to thrive at this location, forming a stable subspontaneous population. These individuals likely originated from the plants in the Cronquist Garden, located approximately 110 m away, where the species is cultivated and where some escapes from the designated planting beds into adjacent plant collections had previously been noted—up to 5 m distance in 2021.

In Belgium, *Muscari comosum* is generally not considered native. According to Verloove & Van Rossum (2023), it is not part of the indigenous flora, although a few possibly subspontaneous populations have been recorded, especially in the Maritime district. Distribution maps by Van Landuyt *et al.* (2006) show its presence in the northernmost parts of Flanders, but not in the loamy area around Meise. However, some of these populations—particularly coastal sites known from before 1950—do not fit the typical pattern of recent garden escapes. This suggests that certain populations may be archaeophytes, with a longer history in Belgium and neighboring parts of northwest France, where the natural range extends to the Somme region. The population in Meise is almost certainly not natural and likely results from a more recent introduction.

Herbarium: A. Ronse 4962, Meise Botanic Garden, s 51, herbetum, under trees, 26.05.2021; A. Ronse 5266, Meise Botanic Garden, herbetum, cultivated, 05.04.2023.

Figure 16. *Muscari comosum* flowering in halfshade.

› *Phyllanthus tenellus* Roxb. (Phyllanthaceae) (Fig. 17)

This species is native to Comoros, Madagascar, Mauritius, Mozambique, Réunion, Saudi Arabia, Tanzania and Yemen. It is widely introduced in tropical and subtropical regions around the world, including Angola, Australia, New Caledonia and New Guinea, Japan, India, Sri Lanka, Iran, several states of the United States, Mexico, Argentina, Brazil, Costa Rica and Venezuela. In Europe, it is only known as an alien in Italy (including Sicily and Sardegna), and from the Canary Islands and Madeira. It is an annual and grows primarily in the seasonally dry tropical biome (POWO, accessed 7 May 2025).

This species is not cultivated at MBG. However, in August 2010, several dozen flowering and fruiting individuals of *Phyllanthus tenellus* were found growing in the open nearby a dumping site of organic waste from the collection and propagation greenhouses in sector 59. These plants likely originated from specimens that had established as weeds inside the greenhouses and were subsequently discarded along with organic waste. Germination and successful development into flowering and fruiting plants presumably followed shortly thereafter. The species did not persist beyond that year, most likely due to its inability to survive winter temperatures under open-air conditions in Belgium. The event is noteworthy, as it represents the first documented outdoor occurrence of *P. tenellus* in Belgium. The only prior national record dates back to 2003, when the species was observed growing prolifically as a weed inside the greenhouses of the Ghent University Botanic Garden (*F. Verloove* 5704 in private herbarium F. Verloove).

Herbarium: A. Ronse 2202, Meise, domain of National Botanic Garden, s 59, several dozen individuals nearby a dumping site of organic waste from the collection and propagation greenhouses, 19.08.2010.

Figure 17. Plants of *Phyllanthus tenellus* growing in the open near a dumping site for organic waste (August 2010).

› *Richardia brasiliensis* Gomes (Rubiaceae) (Fig. 18)

This species is an annual or short-lived subshrub native to South America, with a natural distribution from Ecuador to northern Argentina. It grows primarily in the seasonally dry tropical biome. Outside its native range, it is widely naturalized especially in central and southeastern Africa, and has also become established in parts of the United States, Guatemala, Mexico, India, and Sri Lanka (POWO, accessed 28 April 2025). In much of this introduced range, it is considered an invasive weed (Wikipedia, accessed 24 June 2025).

At MBG, *R. brasiliensis* has been cultivated since 1995, from an accession of unknown wild provenance obtained via the Botanic Garden of Nantes (France). Five plants were initially established in a former propagation greenhouse (KK15), with an additional two planted in a smaller greenhouse within the Plant Palace. Remarkably, all original individuals have survived to the present day in the greenhouse collections, in contrast to many other species cultivated under similar conditions. This demonstrates the species' exceptional vigor and adaptability.

In September 2016, a flowering individual of *R. brasiliensis* was found growing in pavement crevices near the eastern entrance of the former propagation greenhouses. A voucher specimen was collected for the herbarium. Five years later, on 16 March 2021, another flowering plant was observed in the same area, again growing outdoors. These findings suggest that *R. brasiliensis* may have survived multiple winters under local conditions, despite its tropical origin.

This observation represents the first documented occurrence of *R. brasiliensis* in the wild in Belgium, and probably in Europe.

Herbarium: A. Ronse 4138, Meise, domain of botanic garden, s 70, between greenhouses KK1 and KK2, 02.09.2016.

Figure 18. *Richardia brasiliensis* (Rubiaceae) flowering between pavements close to the propagation greenhouses on 16 March 2021.

› *Rosa multiflora* Thunb. (Rosaceae) (Fig. 19)

Rosa multiflora is native to northeast India, parts of China, Korea and Japan. It has been introduced in various parts of the world, including New Zealand, India, Pakistan, Kazakhstan, Uzbekistan, parts of the United States, Mexico, Guatemala, Argentina, Morocco, and several European countries, including Belgium (POWO, accessed 13 May 2025).

The species was introduced to the United States as early as the late 18th century and has since been used ornamentally, as erosion control, and as a living fence (Amrine 2002). However, it has become a problematic invasive in many areas, forming dense thickets that outcompete native vegetation and reduce pasture quality (Munger 2002). Diagnostic features of this rose include clusters of up to 20 relatively small white flowers, leaves with fringed stipules, leaflets measuring 2.5 to nearly 4 cm long, and nearly glabrous seeds contained in small, red, pea-sized hips that often persist throughout winter. Plants are almost spineless and may grow up to 5 m high when supported by other vegetation (USDA National Invasive Species Information Center, accessed 28 Octo-

ber 2024; Nature Today, accessed 1 August 2020).

At the MBG, self-sown individuals of *Rosa multiflora* have repeatedly been observed since 2011, appearing in multiple sectors throughout the domain. However, a notable case was observed at the woodland edge of sector 44, part of the 'Wild Meise' area. There, a robust specimen reached a height of at least 5 m—approximately half the height of the surrounding trees—with a main stem exceeding 5 cm in diameter. Although this individual was cut down and removed, numerous root suckers and saplings have since emerged in the same area, suggesting local persistence and potential for further spread.

The naturalization of *Rosa multiflora* in Flanders is relatively recent, as documented by Verloove (2002). The species is still frequently used in public landscaping, particularly in urban and suburban green spaces. Almost everywhere it has been planted, it readily escapes from cultivation and becomes naturalized.

Herbarium: A. Ronse 1292, Meise, domain of botanic garden, s 44, 05.09.2002; A. Ronse 2230, Meise, Domain of National Botanic Garden, s 38, wood margin, 28.03.2011; A. Ronse 5332, Meise Botanic Garden, s 67, plant ca. 30 cm tall, under poplars, 12.04.2023.

Figure 19. *Rosa multiflora* reaching a height of approximately five meter in 'Wild Meise' (March 2014).

› *Solanum atropurpureum* Schrank (Solanaceae) (Fig. 20)

This species is native to Argentina, Brazil, Colombia, Paraguay and Uruguay (POWO, accessed 10 April 2024). According to Wikipedia (accessed 12 April 2024), it is commonly known by evocative names such as "malevolence", "purple devil" and "five-minute plant". This short-lived perennial herb lives 3 to 5 years and grows up to 1.2 to 1.8 meters tall. It is particularly notable for its dense covering of striking purple-green thorns (~2 cm long), which line the stems and leaves and lend the species its common name. The plant produces yellow-to-white flowers in late spring to mid-summer, followed by small (1–2 cm wide), orange, alkaloid-rich fruits that make the plant toxic to touch and ingest.

In the MBG, this species has been cultivated since 2004 in the Anthropogenic Biome Glasshouse (economic plants collection), sourced from the Belgian commercial nursery l'OrtieCulture.

In October 2013, one spontaneous non-flowering individual was observed in sector 63, over 200 meter distant from the greenhouse plants. This specimen, standing over 1 m tall, bore the same fierce purple thorns and was growing in temporarily fallow ground alongside a mixture of species from a commercial wildflower-grass seed blend. Although initially suspected to have arrived via the seed mix, the species is not known to be included in it, and is rarely cultivated in the wild. Instead, further investigation revealed that the greenhouse accession was occasionally placed outdoors during summer months, including in 2012 (evidenced by a dated photograph). We therefore postulate that local birds or other frugivores consumed the fruits and dispersed the seeds to the fallow area approximately 225 m away.

This represents the first recorded occurrence of *S. atropurpureum* outside cultivation in Belgium. We are not aware of other instances of the species as an adventive or escaped plant elsewhere outside its native range.

Herbarium: A. Ronse 3011, Meise Botanic Garden, s 63, one non-flowering plant, erect, >1 m tall, 22.10.2013.

Figure 20. The stems and leaves of the Purple Devil (*Solanum atropurpureum*) are densely covered with long purple thorns.

› *Solanum aviculare* G.Forst. (Solanaceae) (Fig. 21)

This species, commonly known as kangaroo apple or New Zealand nightshade, is native to New Zealand and the Australian states of Queensland and Victoria, as well as Norfolk Island. It has been introduced in South and Western Australia, New Guinea, New Caledonia, Vanuatu, the United States (California, Oregon and Hawaii), and parts of the North Caucasus and Transcaucasus (Russia, Georgia, Azerbaijan and Armenia) (POWO, accessed 20 May 2025).

At MBG, a single accession of *S. aviculare*—originally sourced from the La Mortola Botanical Garden, Italy—is cultivated since 1977 across multiple greenhouses in the Plant Palace complex (Evolution House PPB, Subtropical Rainforest House PPA, and formerly in greenhouses PP5 and PP20).

In May 2018, approximately half-meter-tall seedlings emerged in the inner courtyard of the Herbarium building—a partially enclosed courtyard featuring a central water element. By September 2019, several plants had grown to around 1.7 m in height and were

fruiting. The presence of ripe fruits confirmed species identification, but subsequent removal of the vegetation in 2020 eliminated the plants. In August 2025, more than ten seedlings, measuring between 1 and 1.5 m tall, were also observed in greenhouse PP15. This is one of the few inner greenhouses of the Plant Palace where not all collection plants have been completely removed.

Morphological traits distinguishing *S. aviculare* from the related *S. laciniatum* include: orange-red to scarlet fruits (rather than yellow-orange), smoother fruit surface due to smaller stone cells, and long-acuminate leaf tips (versus the shorter acuminate tips of *S. laciniatum*) (Symon 1981).

This marks the first documented occurrence of *Solanum aviculare* outside cultivation in Belgium. The temporary occurrence of *S. aviculare* at MBG demonstrates the species' capacity for spontaneous emergence and reproductive viability—but its survival in temperate outdoor environments is limited. Its current status in Belgium therefore remains as a singular, first-recorded escape with no signs of broader naturalization.

Herbarium: A. Ronse 4349, Meise Botanic Garden, s 65, 31.05.2018; A. Ronse 4799, Meise Botanic Garden, s 65, inner courtyard, 27.09.2019.

Figure 21. *Solanum aviculare* in the inner courtyard of the Herbarium building: seedling on 31 May 2018; larger plants on 27 September 2019.

› *Tellima grandiflora* (Pursh) Douglas ex Lindl. (Saxifragaceae) (Fig. 22)

This species is native to western North America, from the Aleutian Islands and coastal Alaska to the western United States. It is introduced and locally naturalized in parts of northern and western Europe, including Denmark, Germany, Great Britain, Ireland and Norway (POWO, accessed 23 April 2024). It is sometimes confused with *Tolmiea menziesii*, also a member of the Saxifragaceae family and originating from western North America, which has also become naturalized in parts of Europe. In the vegetative state, *T. menziesii* can be distinguished by its terminally pointed leaves, in contrast to the more rounded leaf apex in *Tellima grandiflora* (Botany in Scotland, accessed 23 April 2025).

At Meise Botanic Garden, plants of *T. grandiflora* with no known wild origin were first introduced in 1963 from the Ghent University Botanical Garden (HBU). These were planted in the Cronquist Garden as well as along the Orangery Pond (sector 21). A second accession, planted in the same sector in 1990, has since disappeared.

Spontaneous individuals have been recorded in the garden since 2008, occurring in various wooded areas. The first cluster of records comes from central sectors of the domain (sector 14 in May 2008; sectors 15 and 33 in May 2012; and sector 34 in April 2024), likely originating from the cultivated population in sector 21. A second cluster lies in the southern part of the domain, with observations from sectors 54 and 63 dating back to April 2009. Here, especially in the Woodland Garden (part of sector 54), plants have steadily expanded their range over more than 200 meters. The local abundance of the species even gives the impression of intentional planting, although it is more likely the result of spread from cultivated individuals in the Cronquist Garden.

In recent years, an increasing number of grazed inflorescences have been observed in this area, with only the basal parts of the flowering stalks remaining. This damage is likely caused by roe deer (*Capreolus capreolus*), which are common in the garden and appear to be particularly fond of the flowering shoots of this species.

The naturalization of *Tellima grandiflora* in Flanders appears to be relatively recent. According to Verloove (2002), the species was still in the early stages of establishment at the beginning of the 2000s, with only a few more or less persistent locations, and its naturalized status was still considered doubtful. The species was not yet included in the *Atlas van de Flora van Vlaanderen* (Van Landuyt *et al*. 2006), indicating that it had not yet become a permanent component of the regional flora at that time. However, over the past two decades, *T. grandiflora* has become firmly and relatively widely established, with prominent clusters of occurrence, for instance, in the Antwerp Kempen and the Bruges area (waarnemingen.be).

These records confirm that *Tellima grandiflora* has transitioned from a cultivated ornamental to a well-established naturalized species in parts of Belgium, particularly in moist, shaded woodland habitats.

Herbarium: A. Ronse 1709, Meise Botanic Garden, s 15, half shade, under trees, three individuals, with *Hieracium lachenalii*, 20.05.2008; A. Ronse 3395, Meise Botanic Garden, s 54, 15.09.2014; A. Ronse 5764, Meise Botanic Garden, s 34, wood margin, 19.04.2024.

Figure 22. The flowering shoots of *Tellima grandiflora* appear to be a true delicacy for the roe deer.

› *Tradescantia fluminensis* Vell (Commelinaceae) (Fig. 23)

This species is native to southeastern Brazil through to North Argentina. It is widely introduced in various regions across the globe, including Bolivia, several U.S. states, Australia, New-Zealand, Morocco, Tunesia, South Africa, as well as numerous Asian countries. In Europe, it occurs in Cyprus, France, Great-Britain, Greece, Italy, Portugal, Romania and Spain (POWO, accessed 15 April 2025).

Tradescantia fluminensis is considered an invasive species, noxious weed, or pest plant in many regions and has been the subject of targeted eradication efforts. It is particularly problematic in Australia, New Zealand, the southeastern United States, and Portugal (including the Azores and Madeira) (e.g., Dugdale *et al.* 2015). In South Africa, it is classified as a Category 1b Invasive Species, meaning it may no longer be planted, propagated, or allowed to be dispersed. Trade in its seeds, cuttings, or other propagative material is strictly prohibited in both urban and rural areas (Wikipedia, accessed 29 March 2024).

Three accessions of *T. fluminensis* have been cultivated in the greenhouses of the Plant Palace. Two of these were grown in greenhouse PP20: one of unknown origin accessed in 1907, and another obtained from HBU Strasbourg (France), also without a known wild provenance. A third accession was cultivated in the Tropical Rainforest House (PPE). All of these cultivated specimens are now listed as dead.

Despite this, *T. fluminensis* has been found as escape in the inner court of the Herbarium Building in 2018. A significant population was present there with flowering individuals covering several square meters. This courtyard is an enclosed area, inaccessible to the public and only sporadically visited by staff. All species occurring there are spontaneous, having arrived via wind dispersal or ornithochory. During the COVID-19 pandemic in 2020, the area was cleared of herbaceous vegetation (including *T. fluminensis*) and temporarily used as an outdoor dining space for staff. The species has not been seen there again afterwards.

Until recently, *Tradescantia fluminensis* was thought to be the only creeping species of its genus with white flowers occurring in the wild in Belgium. However, during our research we also found a closely resembling species in MBG, which can be reliably distinguished based on vegetative characters (see *T. mundula* further below). Both *T. fluminensis* and *T. mundula* rarely flower outdoors, and they are sometimes misidentified as *Commelina communis*, a summer annual sometimes seen in urban habitats in Belgium. However, both *Tradescantia* species are perennials with on average smaller leaves featuring ciliolate margins (*T. mundula* additionally has hairs on stems and leaves), whereas *C. communis* has larger leaves with glabrous margins (Alien plants of Belgium, accessed 29 March 2024).

The species was first reported in the wild in Belgium in 1988 (Verloove 2006). Since then, it has become clearly naturalized in several urban centers, especially in and around the larger cities of Antwerp, Brussels, and Ghent, as shown by the distribution heatmap on waarnemingen.be. It is often found in thermally favorable microhabitats such as basement wells, at the foot of south-facing walls, or in other sheltered urban niches. In some of these locations, it has persisted for nearly two decades, forming stable, often dense vegetative mats. However, our present study has revealed the presence in Belgium of *Tradescantia mundula*, a morphologically similar species that had long gone unnoticed. As critical diagnostic characters (such as the presence and distribution of hairs) are often difficult or impossible to assess in photographs, it cannot be ruled out that some records identified as *T. fluminensis* may in fact refer to *T. mundula*.

Herbarium: A. Ronse 4357, Meise Botanic Garden, s 65, 31.05.2018.

Figure 23. *Tradescantia fluminensis* (large-leaved) and possibly *T. mundula* (small-leaved) growing in the inner courtyard of the Herbarium building, May 2018. The smaller-leaved individuals resemble *T. mundula*, which typically has consistently smaller leaves.

› *Tradescantia mundula* Kunth (Commelinaceae) (Fig. 24, 25)

This species is native to Argentina, Brazil, and Uruguay (POWO, accessed 31 July 2025). While this source does not mention any naturalized occurrences outside its native range, records in GBIF suggest otherwise. *Tradescantia mundula* has clearly been overlooked in warm-temperate and subtropical regions around the world. For example, in New Zealand it has been recorded naturalized from Chatham Islands. Interestingly, it is self-compatible and reproduces from seed, contrary to *T. fluminensis* that spreads by vegetative ramets (Heenan *et al.* 2022). Seedlings have also been observed in the Meise Botanic Garden (Fig. 24), further confirming its ability to reproduce sexually. GBIF also lists occurrences in Japan and England, although the context of these records remains uncertain and the identifications may require confirmation. Nonetheless, it is likely that increased attention to this species will reveal many more records in the coming years.

At Meise Botanic Garden, one accession of this species has been

cultivated since 1968 under the name of *Tradescantia albiflora* Kunth emend. G.Brückn. 'Albovittata'. The plants were obtained from the Botanic Garden of Duisburg (Germany), without any known wild provenance, and were present in two of the Plant Palace collection greenhouses (PP20 and PPI), as well as in two greenhouses of the former nursery greenhouses. The individuals in the Plant Palace have since been recorded as dead, while those in the nursery greenhouses were removed during the construction of the Green Ark.

In August 2011, several dozen flowering individuals of *T. mundula* were found growing spontaneously outdoors, in the vicinity of the former propagation greenhouses. The species was seen again in the same area in August 2016. It was later also recorded as a weed in greenhouse PP11 in the Plant Palace. This infestation clearly originated from the cultivated plants in PP20, one of the smaller collection greenhouses at the center of the Plant Palace complex. During a visit to these greenhouses in 2019, we frequently found it as a persistent greenhouse weed, either growing among cultivated plants on benches, on the ground beneath them, or in shaded corners. Following the relocation of the collections to the newly constructed Green Ark, a multitude of plants of *T. mundula* were found thriving both inside and outside the now-empty greenhouses (Fig. 25), where they remain present today.

This species has not previously been recorded in the wild in Belgium. The massive growth observed in Meise demonstrates its invasive behavior, at least under sheltered and climatologically favorable microhabitats in the immediate vicinity of greenhouse infrastructure. It cannot be ruled out, however, that some urban populations in Belgium currently attributed to *T. fluminensis* may in fact belong to this species, given the close morphological similarity between the two.

The most notable difference lies in the indumentum. *T. mundula* is consistently and conspicuously strigose—its stems, leaves, and pedicels are covered with erect to appressed hairs. In contrast, *T. fluminensis* is usually entirely glabrous or only very sparsely pubescent (appearing hairless to the naked eye), with glabrous leaf surfaces. In most cases, this difference is readily apparent, and typical representatives of both species have been found escaped. One sample, however—*A. Ronse* 4610, collected in collection greenhouse 16 of the Plant Palace—shows somewhat intermediate characteristics. It remains unclear whether this points to potential hybridization, or simply represents less typical individuals of one of the two species. In addition, the abaxial leaf surface in *T. mundula* is consistently purplish, whereas in *T. fluminensis* it is typically green, only occasionally becoming darker.

Herbarium: A. Ronse 2284, Meise Botanic Garden, between greenhouses, 25-30 plants, translucent filaments, 29.08.2011; A. Ronse 4124, Meise Botanic Garden, s 70, between greenhouses, 30.08.2016; A. Ronse 4610, Meise Botanic Garden, PP 11, 01.09.2019; A. Ronse 6413, Meise Botanic Garden, in empty greenhouse PP 16 in Plant Palace, hairy leaves, 28.07.2025; A. Ronse 6414, Meise Botanic Garden, between empty greenhouses of Plant Palace, weed, 08.08.2025; A. Ronse 6421, Meise Botanic Garden, in empty collection greenhouses of Plant Palace (PP 16), hairy leaves, 28.07.2025.

Figure 24. Young self-sown seedling of *Tradescantia mundula* growing outdoors between greenhouses of the Plant Palace, September 2011.

Figure 25. *Tradescantia mundula* outside the greenhouses of the Plant Palace (↑) and in empty and unheated collection greenhouses of the Plant Palace (↓), both April 2024.

Table 1. Taxa found as escapes from cultivation in MBG. – First mention: '–', In Belgium also known from outside MBG; 'B', first mention for Belgium as garden escape; 'W', first mention worldwide as garden escape. 'Persistent', observed during at least 5 years in MBG.

Species	First mention	Native to Belgium	Persistent
Amorpha fruticosa	–	No	Y
Aquilegia vulgaris	–	Yes	Y
Berberis julianae	–	No	Y
Camassia leichtlinii subsp. *leichtlinii*	B	No	Y
Chamaemelum nobile	–	No	N
Clematis recta	–	No	Y?
Crocus flavus	B	No	N?
Crocus tommasinianus	–	No	Y
Cyclamen coum	–	No	Y
Cyclamen hederifolium	–	No	Y
Muscari armeniacum	–	No	Y
Muscari azureum	–	No	Y
Muscari comosum	–	No?	Y
Phyllanthus tenellus	B	No	N
Richardia brasiliensis	B	No	Y
Rosa multiflora	–	No	Y
Solanum atropurpureum	B +W	No	N
Solanum aviculare	B	No	Y?
Tellima grandiflora	–	No	Y
Tradescantia fluminensis	–	No	Y
Tradescantia mundula	B	No	Y

Discussion and conclusion

This study reports on 21 taxa of flowering plants that have escaped from cultivation within the domain of Meise Botanic Garden. These are listed in Table 1, including details on their occurrence as garden escapes, their native status in Belgium, and their apparent ability to persist if not actively removed.

Most taxa are geophytes—mainly bulbs and corms—while a smaller number are woody shrubs; no (large) trees are included in the present selection. With the exception of *Aquilegia vulgaris* and possibly also *Muscari comosum*, which is native to the southern part of Belgium, all species are non-native to the country.

Seven taxa (*Camassia leichtlinii* subsp. *leichtlinii*, *Crocus flavus*, *Phyllanthus tenellus*, *Richardia brasiliensis*, *Solanum atropurpureum*, *Solanum aviculare,* and *Tradescantia mundula*) are here reported for the first time as garden escapes in Belgium. Six taxa are clearly naturalized in Belgium and appear to be increasing in frequency. The remaining are only locally naturalized or merely ephemeral relics from cultivation in Belgium.

Approximately 70% of the taxa discussed here have shown persistent behavior in Meise, surviving for at least five years unless removed or their habitat was disturbed. For some species, such persistence is uncertain—for example, *Clematis recta* has been observed multiple times in different locations, but was repeatedly cut down or dug out shortly after each appearance. Still, most of the persistent taxa have previously been reported elsewhere in Belgium, except for *Camassia leichtlinii* subsp. *leichtlinii*, which appears to be restricted to Meise.

Species that are clearly expanding within various parts of the garden include *Rosa multiflora*, *Aquilegia vulgaris*, *Tellima grandiflora, Crocus tommasinianus*, and *Cyclamen coum*. Some of these have shown invasive tendencies at other locations in Belgium as well.

On a global scale, most taxa reported here are known elsewhere as weeds or escapes, with varying levels of invasiveness or weed risk. Eleven of them are considered invasive in at least some parts of the world, while eight others are naturalized but pose a relatively low weed risk. For one species—*Solanum atropurpureum*—no previous records as escapes were found. It appears to have been a casual escape from the greenhouses and did not survive the winter.

In comparison with the earlier study conducted in Meise Botanic Garden (Ronse & Verloove 2021), this study predominantly shows a continuity in the pattern of the discussed garden escapes. Both contributions mainly treat non-woody species. A second similarity is that the majority of the taxa is persistent in both, even when taking into account the fact that the definition of persistency was altered in the present contribution from at least two years to at least five years. A third resemblance is that both studies show between 35% and 40% new taxa for Belgium, and moreover few new mentions on a global scale.

Several species in the current dataset show signs of local expansion and increasing persistence, particularly *Rosa multiflora* and *Tellima grandiflora*, but also *Berberis julianae, Crocus tommasinianus* and *Cyclamen coum*, and in thermophilic environments *Tradescantia fluminensis* and *T. mundula* as well. Overall, the findings support the earlier conclusion that ongoing monitoring remains essential, especially as some taxa, once thought to be merely ephemeral, may persist or even spread under favorable conditions.

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