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Review

STRAWBERRY CULTIVARS PRESERVED IN THE SWEDISH NATIONAL GENE BANK

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Some 35 cultivars of Fragaria *are preserved in the Swedish National Gene Bank for vegetatively propagated crops, which opened in 2016. The genebank includes a field collection in Alnarp, southern Sweden, and a back-up collection of virus-free plants at the Swedish Elite Plant Station. Here we document how the cultivars, the so-called mandate cultivars, were selected. Swedish origin was the primary criteria used in the selection process. In this category cultivars from historic Swedish breeding programmes are of particular interest. During 80 years, starting in the 1920s and ending in the late 1990s, 16 strawberries including three* Fragaria × vescana *hybrids were developed by Swedish breeders. Unfortunately, for three of these the accessions in the genebank are uncertain and four have not yet been recovered. The 16 cultivars bred in Sweden are presented with their year of introduction, parentage and short descriptions. Additionally, we also briefly describe local cultivars of strawberries and wild strawberries. Another category of mandate cultivars are foreign cultivars with a growing tradition in Sweden dating back to before 1966. Their age, country of origin, and importance for Swedish cultivation are discussed.*

Keywords: *genetic resources, genebank, heirloom cultivars,* Fragaria × ananassa, Fragaria vesca, Fragaria × vescana.

INTRODUCTION

Three species of *Fragaria: F. vesca* L. (2n = 14), *F. viridis* Weston (2n = 14), and *F. moschata* Weston (2n = 42), grow wild in Sweden (Anderberg and Anderberg, 2017). The most important of these is the wild strawberry *F. vesca*, which is found all over the country, except in the Scandes. The wild strawberry was first noted in Swedish sources in the Late Middle Ages (Nordstedt, 1920) and has been consumed for pleasure, food, and medicinal purposes for hundreds of years. The botanist Carl Linnaeus was very fond of the berries and consumed them as a treatment for gout (Möller, 2015). *F. viridis* is only found occasionally in central Sweden and on the Baltic Sea islands of Gotland and Öland. Neither is the hautbois strawberry *F. moschata* common. Its primary distribution extends from Scania in the south to Dalecarlia in the north and it is often found near old estates where it used to be cultivated under the name "jordgubbe". In the early 20th century, when the cultivation of *F.* × *ananassa* became dominant, the name "jordgubbe" was taken over by the hybrid strawberry.

The strawberry *F.* × *ananassa* (Weston) Rozier (2n = 56) is the result of a crossing between two American species, *F. chiloensis* (L.) Mill. (2n = 56) and *F. virginiana* Mill. (2n = 56), which were brought to Europe in the 17th and 18th centuries, respectively. After the genesis of the strawberry in France, the English became the first to develop cultivars. Breeding work also started early in France, Germany and U.S.A. (Darrow, 1966).

In 1866, the first Swedish pomology was published by Olof Eneroth and about ten pages are dedicated to *Fragaria*. Eneroth mentions three variants of cultivated *F. vesca*, the most important being the alpine everbearing strawberry (*F. vesca* 2n = 14), known since 1760 and occurring with both red and white fruits. Furthermore, some cultivars of *F. virginiana* are mentioned as cultivated in Sweden of which 'Roseberry' is said to be the most promising. *F. chiloensis*

is considered not hardy enough. Eneroth also describes five, mostly English, cultivars of *F.* × *ananassa*.

In Smirnoff's revised edition of the pomology (Eneroth and Smirnoff, 1902) the chapter on strawberries is enlarged, reflecting the growing importance of *F.* × *ananassa*. We also learn that the five cultivars in Eneroth (1866) had been tested by Eneroth already in the 1850s and that 'Keen's Seedling' turned out to be the best. This cultivar was also grown in the gardens of the manor Sävstaholm in the 1870s and 1880s. It is also reported that the five cultivars described in 1866 have been surpassed by other cultivars. Altogether 29 cultivars of *F. ananassa* are presented by Eneroth and Smirnoff (1902). Among them 'Abundance' (from the 1860s) is kept in the National Gene Bank today. We also recognise 'Vicomtesse Héricart de Thury' (from 1849) as an important parent in the early strawberry breeding at Alnarp.

CULTIVAR SELECTION AND PRESERVATION IN THE NATIONAL GENE BANK

For the National Programme for Diversity of Cultivated Plants (Pom), which started its activities in 2000, it was important to find and select old cultivars of *Fragaria* that were worth preserving for the future. Thus, the first step was to identify so-called mandate cultivars in the literature (Hjalmarsson and Wallace, 2004). Mandate cultivars were defined as 1) cultivars from historic Swedish breeding programmes 2) locally named cultivars, and 3) foreign cultivars with a Swedish growing tradition. When the National Gene Bank was opened in 2016, about 25 mandate cultivars had been gathered in the genebank fields at the Swedish University of Agricultural Sciences (SLU) in Alnarp, most of them from old collections. Since then, another ten cultivars have been added, mainly through Pom's national inventory that asked the general public to report old cultivars. As a security back-up to the collection in Alnarp, where 4–5 plants of each mandate cultivar are kept, two additional plants of each accession are also held as virus-free plants in protected cultivation at the Swedish Elite Plant Station. However, the back-up system is not yet completed as some cultivars still have to be tested for viruses.

CULTIVARS FROM HISTORIC SWEDISH BREEDING PROGRAMMES

According to Eneroth and Smirnoff (1902) the first systematic attempts to breed *Fragaria*-species in Sweden were made in the 1890s by Director E. Lindgren at the Experimental Field of the Swedish Royal Academy of Agriculture in Stockholm. Apparently, this work, which was based on open pollination of known strawberry cultivars, had some success. Berry weights up to 15 g are reported and some of the resulting plants ripened early, already in the middle of June. Despite this, and Eneroth and Smirnoff stressing the importance of developing Swedish cultivars, it is uncertain whether any named cultivars were released from Lindgren's breeding programme.

Strawberry cultivars from Alnarp. Starting in the 1920s Swedish strawberry breeding became the business of Statens Trädgårdsförsök (ST) in Alnarp. The primary goal of the breeding programme, which was run by Emil Johansson, was to obtain cultivars with attractive taste and high yield (Reimer, 1935). Between 1933 and 1954, eight cultivars, described below, were released. For their parentage see Table 1.

'Inga'. Breeder Emil Johansson. Cross made in 1924. Introduced in 1933. Rather weak but healthy plants. Fruit small (7 g), mostly conical. Fruit colour dark red. Flesh red with refreshing and pleasant taste. Ripens early, 4–5 days after 'Deutsch Evern'. Suitable both for dessert and preservation (Reimer, 1948).

'*Stella'*. Breeder Emil Johansson. Cross made in 1924. Introduced in 1933. Same parentage as 'Inga'. Reimer (1935) gives a joint description for 'Stella' and 'Inga', but remarks that 'Stella' has more irregular fruits and ripens one or two days before 'Inga'. In Reimer (1948) the description of 'Stella' is omitted.

'Luna'. Breeder Emil Johansson. Cross made in 1924. Introduced in 1933. Fruit wedge shaped with dark red colour. Taste is sweet and aromatic. Ripens 10–12 days after 'Deutsch Evern'. Primarily suitable for fresh consumption (Reimer, 1948). Missing in the genebank.

'*Silva'*. Breeders Carl G. Dahl and Emil Johansson. Introduced in 1940. Upright plants. Fruit small (7.6 g), conical. Taste is sweet, refreshing and aromatic. Ripens 6–9 days after 'Deutsch Evern' (Reimer, 1948). Missing in the genebank.

'*Indra*'. (Fig. 1) Breeder Emil Johansson. Cross made in 1936. Introduced in 1951. Vigorous plants. Fruit medium sized, conical or wedge shaped. Fruit colour bright red. Flesh light red and juicy with sweet, pleasant taste. Ripens mid-season. Suitable for dessert. (Johansson, 1950).

'*Landia*'. Breeder Emil Johansson. Selection made in 1945. Introduced in 1954. Vigorous plants. Fruit rather large, conical or wedge shaped. Fruit colour dark red. Flesh light red and firm with sweet-acidity and slightly perfumed taste. Suitable for preservation (Johansson, 1954). Missing in the genebank.

'*Finn*'. Breeder Emil Johansson. Selection made in 1942. Introduced in 1954. Vigorous plants. Poor runner production. High yielding. Large fruits, conical or wedge shaped. Fruit colour dark red. Flesh dark red and firm with slightly perfumed taste. Suitable for industrial production. Used by the food producer Findus in the 1950s (Johansson, 1954). Missing in the genebank.

'*Julia*'. Breeder Emil Johansson. Cross made in 1924. Introduced in 1954. Moderately vigorous plants. Plenty of runners. High yielding. Fruit medium in size, conical. Flesh pinkish white with nice faintly acidic taste. Resembles its parent 'Abundance', but ripens later. Particularly appreci-

Table 1. Cultivars from historic Swedish breeding programmes

Cultivar name	Parentage	Year of release	Status in the Swedish National Gene Bank
Alnarp Strawberry			
Inga	Frau Director Echtemeyer × Vicomtesse Héricart de Thury	1933	Uncertain accession
Stella	Frau Director Echtemeyer × Vicomtesse Héricart de Thury	1933	Uncertain accession
Luna	Späte von Leopoldshall × Vicomtesse Héricart de Thury	1933	Missing
Silva	open pollinated Lucida perfecta	1940	Missing
Indra	Southland × Luna	1951	Accession correct
Landia	Southland × open pollinated Dorset	1954	Missing
Finn	open pollinated Fairfax	1954	Missing
Julia	Späte von Leopoldshall × Abundance	1954	Accession correct
Balsgård Strawberry			
Kristina	Senga Sengana × Valentine	1968	Accession correct
Felicia	Senga Sengana × Valentine	1977	Uncertain accession
Sally	Senga Sengana × Valentine	1979	Accession correct
Lina	(Valentine × Fairfax) × (Valentine × Senga Sengana)	1986	Accession correct
Elin	Red Gautlet × Hecker	1991	Accession correct
Balsgård vescana hybrids			
Annelie	open pollinated Valentine × Rügen 4n	1976	Accession correct
Sara	Annelie × (open pollinated Sparkle × *F. vesca* 4n)	1988	Accession correct
Rebecka	(Fern × *F. vesca* 4n) × unnamed F. × ananassa	1998	Accession correct

Fig. 1. 'Indra' (*F.* × *ananassa*), cultivar from Alnarp. Introduced 1951.

ated in growing districts where 'Abundance' was grown as it could extend the harvest (Johansson, 1954).

Strawberry cultivars from Balsgård. In the 1950s, the strawberry breeding moved from ST in Alnarp to the Association for Fruit Tree Breeding at Balsgård, later SLU Balsgård (Anonymous, 1991). High yields and good pest resistance were important goals in the breeding work at Balsgård. Between 1968 and 1991, five cultivars, described below, were released. For their parentage see Table 1.

'*Kristina*'. Cross made in 1957. Selected by Annelise Bauer. Introduced in 1968. Moderately vigorous plants. Good production of runners. Resistant to mildew (*Sphaerotheca aphanis* (Wallr.) U. Braun). Fruit slightly smaller than medium, round to conical. Fruit colour bright red. Flesh very firm and reddish with attractive tart taste. The berries are hidden under the leaves which makes them difficult to harvest. Ripens early (Bergendahl, 1978).

'*Felicia*'**.** Cross made in 1957. Selected by Elof Oldén. Introduced in 1977. Plants upright and moderately compact. Poor runner production. High yielding. Good resistance against grey mould (*Botrytis cinerea* Pers.). Fruit small (7.7 g), conical. Fruit colour bright red, sometimes lighter tips. Flesh firm, light red, and nice tasting. Ripens early. The application for breeder's rights was withdrawn in 1980 due to susceptibility to June yellow (Bergendahl, 1978; Sakshaug, 1983).

'*Sally*'. Released in 1979 at the request of strawberry growers in northern Sweden. 'Sally' is a sibling of 'Kristina' and 'Felicia' and was selected by Elof Oldén. Excellent hardiness and good berry quality with firm flesh when grown in northern latitudes. Moderately vigorous plants. Plenty of runners. Fruit medium in size, oblate. Fruit colour bright red. Flesh red with nice flavour (Trajkovski and Sjöstedt, 1980).

'*Lina*'. Introduced in 1986. Plants average in vigorousness. High yielding. Mildew resistant. Fruit medium in size, round to conical. Fruit colour dark red. Flesh red, firm and tasty. Good storage qualities. Ripens about the same time as 'Senga Sengana' (Trajkovski and Nilsson, 1984; Trajkovski *et al*., 1986),

'*Elin*'. Breeder Karin Trajkovski. Cross made in 1984. Introduced in 1991. Plants average in vigorousness. Poor runner production. Good resistance against mildew. Day-neutral, second crop at the end of July. Fruit medium in size, conical. Fruit colour bright red. Flesh slightly soft, orange red. Fresh, nice, somewhat acidic taste. Suitable for home gardening (Trajkovski, 1990; 1992).

Vescana hybrids from Balsgård. For about forty years, starting in the 1960s when Rudolf and Annelise Bauer were working at Balsgård, there was also a breeding programme aimed at combining the fine aroma of *F. vesca* with the larger and firmer fruits of *F.* × *ananassa*. This breeding work had to be performed in several steps due to the different chromosome numbers of the two species (Trajkovski, 2002a). Between 1964 and 1998, three cultivars of vescana hybrids (*F.* × *vescana* Rud. Bauer & A. Bauer, 2n = 70), described below, were released. For their parentage see Table 1.

'*Annelie*'. Open-pollinated in 1964. Selected by Annelise Bauer. Introduced in 1975. Plants vigorous, producing plenty of runners. Low yielding. Fruit small, but considerably larger than fruits of *F. vesca*, round to conical. Fruit colour medium red. Flesh soft, orange red with a nice taste of *F. vesca*. Ripens mid-season. Suitable for home gardening (Bergendahl, 1978).

'*Sara*'. Cross made in 1971 by Len-Marie Ek. Selected by Karin Trajkovski. Introduced in 1988. An improvement of 'Annelie' both in terms of yield and berry size. Plants vigorous, producing plenty of runners. Fruit kidney shaped, later on round to conical. Fruit colour red to brick red. Similar in taste to 'Annelie'. Ripens early. Suitable for home gardening (Trajkovski, 1988).

'*Rebecka*'. Breeder Karin Trajkovski. Introduced in 1998. In 1991, a hexaploidy selection from a cross between the Californian day-neutral cultivar 'Fern' and a *F. vesca* 4n was crossed with Balsgård's strawberry selection F861502. The latter had 'Lina', 'Cruz' and 'Honeoye' in its pedigree and was chosen due to its firm fruits and high yield. The resulting day-neutral 'Rebecka' has vigorous and healthy plants with few runners. The first harvest early in June is followed by continuous fruit production until autumn. Fruits weigh 8–9 g, are kidney shaped, later on round to conical. Fruit colour red to brick red. Flesh is soft with excellent taste reminiscent of *F. vesca*. Suitable for home gardening and pick your own (Trajkovski, 2002b).

LOCAL CULTIVARS

Most local cultivars in the genebank are finds from Pom's national inventory. Primarily these were selected for inclusion in the genebank due to their horticultural traits, but also because they have a growing tradition that is relevant to the history of Swedish berry cultivation. In general, their berries are soft, but nicely tasting, and meant for direct consumption. For an overview of these cultivars see Table 2.

Wild strawberry, *F. vesca*. '*Norrlandssmultron*' (Fig. 2) is a local cultivar, from northern Sweden. According to a report in the Swedish newspaper *Svenska Dagbladet*, on 17 August 1946, it originates from a spontaneous cross between the seed propagated German cultivar 'Rügen' (from 1910) and a wild growing of *F. vesca* in a private garden in Härnösand (some 245 km north of Stockholm). During the 1950s and 1960s, it spread to different parts of the country where it was cultivated both in home gardens and commercial orchards (Hjalmarsson, 2007). The cultivar was considered lost but could be retrieved thanks to Pom's national inventory. The accession in the genebank was received from the daughter of a commercial grower in southern Sweden who had preserved her favourite cultivar for almost 50 years. 'Norrlandssmultron' is an alpine strawberry that gives fruit throughout most of the summer. It has beautiful plants that produce a lot of runners and are high yielding. The berries are bright red, roundish, larger than ordinary *F. vesca* and they have a remarkably good taste.

In addition, some white alpine strawberries were incorporated in the genebank as a result of Pom's national inventory. Most likely these are cultivars bought from nurseries

Table 2. Local cultivars

Cultivar	Species	Type of accession	Known since
Gustaf	*F. chiloensis*	Inventory find	before 1920
Vånevik	*F. virginiana*	Inventory find	probably before 1950
Parksmultron från Blekinge	*F. moschata*	Inventory find	about 1900
Amanda	*F. vesca*	Inventory find	before 1940
Morlanda	*F. vesca*	Inventory find	probably before 1920
Norrlandssmultron	*F. vesca*	Local cultivar	1946
Rödluvan	*F. vesca*	Bred by Å. Truedsson	1997
Snövit	*F. vesca*	Bred by Å. Truedsson	1997
Vita smultron från Alnarp	*F. vesca*	Inventory find	before 1936
Bassi	*F.* × *ananassa*	Inventory find	before 1970
Benita	*F.* × *ananassa*	Inventory find	1920s
Mannevik	*F.* × *ananassa*	Local cultivar	about 1950
Skärgårdsgubbe	*F.* × *ananassa*	Inventory find	before 1975
Tärnudden	*F.* × *ananassa*	Inventory find	before 1913
Vita jordgubbar från Vindeln	*F.* × *ananassa*	Inventory find	before 1923

Fig. 2. 'Norrlandssmultron' (*F. vesca*), local cultivar from the 1940s.

in the early 20th century, but whose original names have been lost. Finally, the genebank also keeps the cultivars '*Rödluvan*' and '*Snövit*', which were developed some 20 years ago by the private breeder Å. Truedsson (Truedsson, 2005).

Chilean strawberry, *F. chiloensis* and Virginian strawberry, *F. virginiana.* One accession of each of the parent species of *F.* × *ananassa* was received through Pom's national inventory. The Chilean strawberry was found in Vånevik, south-eastern Sweden, where an orchard was located in the first half of the 20th century. The Virginian strawberry originates from a small cottage outside the town of Älmhult, southern Sweden, where the donor's mother had enjoyed it during her childhood in the 1920s. In the genebank these accessions are named '*Vånevik*' and '*Gustaf*'.

Strawberry, *F.* × *ananassa*. One of the oldest strawberries obtained from Pom's national inventory is a cultivar that has been named '*Tärnudden*' after the abandoned lighthouse where it was found in 2004. The lighthouse is located on the island of Gotland and was inhabited 1883–1913 and it is known that the staff had a kitchen garden with strawberries (Iwarsson, 2013). Now this cultivar, whose original name is lost, gives nice tasting, soft and rather large berries in the genebank.

Another cultivar that can be traced back to the early 20th century is '*Vita jordgubbar från Västomån*'. This white strawberry was brought to the north of Sweden in 1923 by a young couple from Dalecarlia in central Sweden. The man had been contracted to work on the bridge being built across the river Vindeln. When they moved north, they brought plants of this unusual strawberry with them in their luggage. The strawberry eventually ended up in the care of Märta Lövgren's parents in Västomån, a village by Vindeln, and Märta donated it to Pom. It is a delicate strawberry that could perhaps be 'White Pineapple' which was described by Eneroth and Smirnoff in 1902.

In contrast, '*Skärgårdsgubbe*' is difficult to date more precisely, but it is an example of a cultivar once grown in the Stockholm archipelago, which was an important strawberry district in the 20th century (Sundström, 2001). Also, for this cultivar the original name is lost. 'Skärgårdsgubbe' (Fig. 3) grows very vigorously and produces plenty of large, light red and aromatic berries with poor storage qualities.

FOREIGN CULTIVARS WITH GROWING TRADITION IN SWEDEN

In total, there are nine foreign cultivars of strawberry (*Fragaria* × *ananassa*) with a Swedish growing tradition in the genebank. Of these three are from Denmark, three from Germany, one from England, one from what was then Prussia, and one is of unknown geographical origin. For an overview of these cultivars see Table 3.

The two oldest cultivars kept in the genebank are '*Abundance*' and '*Carolina Superba*', which have been grown in Sweden since the second half of the 19th century. In the past, both were considered good croppers giving rich harvests. Their fruits are red with a somewhat acidic taste, and they are well suited for jam-making and other conservation purposes. 'Abundance', is a very hardy cultivar that is well adapted for growth in colder regions and was therefore primarily grown in northern and central Sweden. Further to the south 'Carolina Superba' dominated.

Fig. 3. 'Skärdgårdsgubbe' (*F.* × *ananassa*), inventory find from the Stockholm archipelago.

Table 3. Foreign cultivars

Cultivar	Parentage	Country of origin	Year of introduction
Abundance	Unkown	Unknown	19th century
Carolina Superba	Unkown	England	19th century
Deutsch Evern	Sieger × Laxtons Noble	Germany	1903
J. A. Dybdahl	Unknown	Denmark	1909
Königin Luise	Unknown	Preussen	1905
Senga Precosa	Regina × (Sparkle × Eva Macherauch)	Germany	1960
Senga Sengana	Markee × Sieger	Germany	1954
Ydun	Deutsch Evern × Späte von Leopoldville	Denmark	1948
Zefyr	J. A. Dybdahl × Valentine	Denmark	1965

Due to its early ripening, good berry quality, and being a high yielding cultivar for its time '*Deutsch Evern*' (from 1903) was important for the development of the Swedish strawberry industry. In 1932, it was sold by no less than 35 Swedish nurseries (Reimer, 1935). And in the 1950s, it was still considered an important cultivar in Scania. The contemporary '*Königin Luise*' was also an important cultivar for several decades, but eventually both cultivars were replaced. The introduction of '*Ydun*' in 1948 and '*Senga Sengana'* in 1954 helped to increase output, and in the 1950s, the yearly Swedish strawberry production was estimated to be 10 000 tonnes (Nilsson, 1958).

SUMMARY

The first *Fragaria* species that was cultivated in Sweden was the wild strawberry (*F. vesca*) and then in particular the large fruited alpine everbearing strawberry (*F. vesca*). Prior to the introduction of the strawberry *F.* × *ananassa* in the

19th century there was also a limited cultivation of *F. moschata*, *F. chiloensis*, and *F. virginiana*. The first test orchard with *F.* × *ananassa* was established by Eneroth in the 1850s (Eneroth and Smirnoff, 1902), but it was not until the beginning of the 20th century that this species became more widely spread. By the 1950s, the Swedish strawberry industry had become established with well-known growing districts such as Scania and Blekinge in the south, Finnerödja and Stockholm archipelago in central Sweden and Bergsjö, Helsingia in the north. This development was made possible thanks to cultivars developed both in other northern European countries as well as in Sweden.

The aim of the Swedish National Gene Bank is the long-term preservation of the cultivars that can be considered to belong to the Swedish pomological heritage. Thus, as of today 35 cultivars of *Fragaria* are preserved in the genebank. The majority of these, 66% are *F.* × *ananassa*, 17% are *F. vesca* and 8% *F.* × *vescana*. In addition, there are the odd cultivars of *F. moschata*, *F. chiloensis*, and *F. virginiana*. With respect to origin, 43% are local cultivars, some of which may originally have been foreign, 31% come from historic Swedish breeding programmes, and 26% are known foreign cultivars with a Swedish growing tradition. Finally, grouping the accessions by age, we find that that 28% originate from the period before 1925, 26% from the period 1926–1950, 23% from the period 1951–1975, and 23% from 1976–1998.

Besides being preserved for future generations, the strawberries in the genebank are also available for distribution to researchers, breeders, nurserymen, commercial growers, and others interested in old strawberry cultivars. There are already examples of growers, who have successfully cultivated and sold berries of old cultivars on their local markets. Also, some of the cultivars in the genebank are being considered for marketing under the trademark "Green Heritage", which is owned by SLU and was created to reintroduce old and valuable cultivars to the general public. A book with descriptions (in Swedish) of the 35 strawberry cultivars was published at the end of 2021 (Hjalmarsson, 2021).

REFERENCES

Anderberg, A., Anderberg, A.-L. (2017). *Den virtuella floran* [The virtual flora]. http://linnaeus.nrm.se/flora/ (accessed 24.08.2021) (in Swedish).

Anonymous (1991). *Balsgård*. SLU, Alnarp. 16 pp. (in Swedish).

Bergendahl, P.-O. (1978). *Frukt- och bärsorter från Balsgård 1942–1977* [Varieties of Fruits and Berries from Balsgård 1942–1977]. SLU, Balsgård. 50 pp. (in Swedish).

Darrow, G. M. (1966). *The Strawberry: History, Breeding and Physiology.* Holt, Rinehart and Winston, New York. 447 pp.

Eneroth, O. (1866). *Handbok i svensk pomologi* [Handbook in Swedish Pomology]. Norstedt, Stockholm. 403 pp. (in Swedish).

Eneroth, O., Smirnoff A. (1902). *Handbok i svensk pomologi. Vol. 5* [Handbook in Swedish Pomology. Vol. 5]. Norstedt, Stockholm. 215 pp. (in Swedish).

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Hjalmarsson, I. (2007). Norrlandssmultron [The cultivar Norrlandssmultron]. *Pomologen,* **7** (3), 18–20 (in Swedish).

Hjalmarsson, I. (2021). *Älskade jordgubbar! Ett bärkraftigt kulturarv i Nationella genbanken* [Beloved strawberries! A Sustainable Heritage in the Swedish National Gene Bank]. SLU, Alnarp. 79 pp. (in Swedish).

Hjalmarsson, I., Wallace, B. (2004). Content of the Swedish Berry Gene Bank. *J. Fruit Ornam. Plant Res.,* **12**, 129–138.

Iwarsson, I. (2013). *Jordgubbe* (Fragaria x ananassa) *från Gotska Sandön* [Strawberry (Fragaria × ananassa) from the island of Gotska Sandön]. https://www.slu.se/globalassets/ew/org/centrb/pom/jordgubbe-fran-gotska-sandon.pdf (accessed 22.08.2021) (in Swedish).

Johansson, E. (1950). *Indra – en ny jordgubbsort från Alnarp* [Indra – a New Strawberry Cultivar from Alnarp]. Statens Trädgårdsförsök, Alnarp. 8 pp. (in Swedish).

Johansson, E. (1954). Tre nya jordgubbssorter från Alnarp [Three New Strawberry Cultivars from Alnarp]. Statens Trädgårdsförsök. 8 pp. (in Swedish).

Möller, L. (2015). *Smultron* [Wild Strawberry]. Lund, Arena, pp. 182 (in Swedish).

Nilsson, F. (1958). *Odling av frukt och bär* [Cultivation of Fruit and Berry]. Saxon & Lindströms, Stockholm. 296 pp. (in Swedish).

Nordstedt, O. (1920). *Prima loca plantarum suecicarum. Första litteraturuppgift om de i Sverige funna vilda eller förvildade kärlväxterna* [First records of wild and undomesticated vascular plants in Sweden]. *Bilaga till Botaniska Notiser.* 1920: 1-95. Lund, Berlingska boktryckeriet. 95 pp. (in Swedish).

Reimer, C. (1935). *Bärodling* [Small Fruit Cultivation]. Nordisk rotogravyr, Stockholm. 276 pp. (in Swedish).

Reimer, C. (1948). *Bärodling*. 2. uppl. [Small Fruit Cultivation. 2nd ed.]. Nordisk rotogravyr, Stockholm. 276 pp. (in Swedish).

Sakshaug, K. (1983). *Sortförsök med jordgubbar i södra och mellersta Sverige* [Cultivar Trials with Strawberry in Southern and Central Sweden]. SLU, Alnarp. 18 pp. (in Swedish).

Sundström, A. (2001). Jordgubbsodling i Stockholms skärgård [Strawberry cultivation in the Stockholm archipelago]. *Skärgård.* Nr. 62, 9–16 (in Swedish).

Trajkovski, K. (1988). Växtförädling av jordgubbar [Strawberry breeding]. In: *Report 1986–1987, Swed. Univ. Agr. Sci., Div. Fruit Breed., Balsgård*, 26–37 (in Swedish and English).

Trajkovski, K. (1990). Växtförädling av jordgubbar [Strawberry breeding]. In: *Report 1988–1989, Swed. Univ. Agr. Sci., Div. Fruit Breed., Balsgård*, 31–45 (in Swedish and English).

Trajkovski, K. (1992). Växtförädling av jordgubbar [Strawberry breeding]. In: *Report 1990–1991, Swed. Univ. Agr. Sci., Div. Fruit Breed., Balsgård*, 34–40 (in Swedish and English).

Trajkovski, K. (2002a). Breeding strawberries and hybrids with wild wood strawberries. *Nordiske Genressurser*, **1** (1), 22–23.

Trajkovski, K. (2002b). Rebecka, a day-neutral *Fragaria* × *vescana* variety from Balsgård. *Acta Hortic.* **567**, 177–178.

Trajkovski, K., Sjöstedt, B. (1980). Beskrivning av jordgubbssorten Sally, framställd vid Balsgård [Description of the new strawberry variety Sally]. In: *Report 1978–1979, Swed. Univ. Agr. Sci., Div. Fruit Breed., Balsgård*, 22–23 (in Swedish and English).

Trajkovski, K., Nilsson, K. (1984). Växtförädling av jordgubbar [Strawberry breeding.] In: *Report 1982–1983, Swed. Univ. Agr. Sci., Div. Fruit Breed., Balsgård*, 29–32 (in Swedish and English).

Trajkovski, K., Nilsson, K., Christensen, L. (1986). Växtförädling av jordgubbar [Strawberry breeding]. In: *Report 1984–1985, Swed. Univ. Agr. Sci., Div. Fruit Breed., Balsgård*, 26–33 (in Swedish and English).

Truedsson, Å. (2005). *Frukt och bär* [Fruit and berry]. Natur och trädgård, Stockholm. 112 pp. (in Swedish).

ZVIEDRIJAS NACIONĀLAJĀ GĒNU BANKĀ SAGLABĀTĀS ZEMEŅU ŠĶIRNES

Zviedrijas Nacionālajā veģetatīvi pavairojamo kultūraugu gēnu bankā, kas atklāta 2016. gadā, tiek glabātas 35 *Fragaria* šķirnes. Gēnu banka ietver lauka kolekciju, kas atrodas Alnarpā, Zviedrijas dienvidos, un vīrusbrīvo augu rezerves kolekciju Zviedrijas elites augu stacijā. Šeit notiek augu materiāla dokumentēšana, šķirņu atlase, izvēlētas mandāta šķirnes. Zviedrijas izcelsme bija viens no galvenajiem atlases procesā izmantotajiem kritērijiem. Šajā kategorijā īpašu interesi raisa šķirnes, kas izveidotas Zviedrijas vēsturisko selekcijas programmu rezultātā. Astoņdesmit gadu laikā, sākot no 20. gadsimta 20. gadiem un beidzot ar 90. gadu beigām, Zviedrijas selekcionāri izveidojuši 16 zemeņu šķirnes, tostarp trīs *Fragaria* × *vescana* hibrīdus. Diemžēl trim no tām gēnu bankā iekļauto paraugu identitāte ir neskaidra, un četras vēl nav atgūtas. Sešpadsmit Zviedrijā selekcionētās šķirnes tikušas dokumentētas ar ieviešanas gadu, izcelsmi un īsiem aprakstiem. Līdzīgi tiek aprakstītas arī vietējās zemeņu un meža zemeņu šķirnes. Vēl viena mandāta šķirņu kategorija ir ārvalstu šķirnes ar audzēšanas tradīcijām Zviedrijā, kas aizsākušās pirms 1966. gada. Tiek analizēts to vecums, izcelsmes valsts un nozīme audzēšanā Zviedrijā.