

Swedes in Sweden – the renaissance of a low-status crop

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Swede, or rutabaga (*Brassica napus* Napobrassica-Group), is a traditional vegetable in Swedish cuisine. It has however long been considered as dull and a last-choice among vegetables (Figure 1). The swede is also associated with war-time food in Sweden and many other countries in Northern Europe, contributing to its bad reputation. Nevertheless, when a national seed call was performed in the early 2000's, many heirloom swede landraces were gathered. In many cases, they had been preserved for their sensory qualities.

In 2015 we began to evaluate landraces and obsolete cultivars of swedes in Sweden for agronomic and sensory characteristics. In parallel, work was initiated of small-scale seed production and marketing of traditional cultivars. Here, we report on this work and how swedes are now a sought-after crop and served with pride on the best Swedish restaurants.



Figure 1. "Rotmos", mashed swedes, is the most traditional dish made from swedes, but has an unearned bad reputation. Photo: Patrik Arneke.

A brief account on origin and history

Already the English name "swede" points at a Swedish origin of the crop. Similarly, a Swedish origin is indicated by the German "Schwedische Rübe" and French "chou suédois". The American name "rutabaga" has its roots in "rotabagge", a dialectal word for Swede in the province Västergötland in Sweden. So, if Swedish, when did swedes first occur?

First, we can conclude that the swede is a hybrid between two cultivated species. No wild ancestor has ever been found. Earlier conclusions that Linnaeus' notes on "Brassica napus" on the island Gotland should refer to swedes have proved false (Ahokas, 2004).

Instead, the hybridisation must have occurred at a place where both turnips (the mother) and kale (the father) were cultivated. In Northern Europe this was the case for most vegetable patches in the Medieval and Early Modern Period. Illustrations and written records from this time are however surprisingly void of swedes although both parental species occur frequently. The first certain record of swedes was made by Elias Tillandz (1683). Tillandz was a professor in botany, active in Åbo, Finland (then a part of Sweden) and described the local flora and crops.

In the 18th century, swede cultivation expanded rapidly and swedes became a base food in Sweden (Hallgren, 2016). The crop was eventually exported to Great Britain and became an essential part of the agricultural revolution and early crop rotation systems (Harvey, 1949). Also in France, Germany and the Americas were swedes taken up as an important crop at the turn of the 18th century. In Sweden, on the other hand, swedes were to some extent outcompeted by potatoes in the 19th century and partly reduced to a horticultural crop (Figure 2). In the early 20th century swede cultivation again expanded, but then as a fodder crop. After WW2 the demand and cultivation of swedes have constantly decreased.

Plant breeding of swedes occurred in Sweden from the 1880s until the end of the 20th century. Both fodder and vegetable types were bred and both Scottish and German fodder types as well as Swedish landraces were used as parental lines (Osvald, 1959). Although many varieties were released in the first half of the century the number of registered varieties had been reduced to three in the 2000s (Lyhagen, 2016).

In situ conservation of swede landraces

In the 1950s, many farms and gardeners still maintained their own breeds of swedes (Osvald, 1959). It was generally believed that this tradition ceased completely the decades to come, but when a "seed call" was performed within the Swedish programme for diversity of cultivated plants in 2002-2004 surprisingly many locally maintained swede landraces were still found in active cultivation (Nygårds and Leino 2013).

The central area for the extant growing of swede landraces, including their seed multiplication, appears to be between the 60th and 65th parallel since all recent collections have been made here. This region includes the administrative regions of Västerbotten, Ångermanland, Jämtland, Medelpad, Hälsingland and Dalarna, the latter of which proved particularly rich in landraces and/or local cultivars.

Here, maintenance of local cultivars by seed production of farmers and gardeners themselves is still an active tradition (Magnusson, 2019). Nygård and Leino (2013) speculate that one possible reason for the lack of cultivation further south in Sweden is due to the pest and disease pressure being high as a result of oilseed rape being grown extensively. Another reason could, of course, be that local culinary traditions had developed that safe-guarded continuous cultivation of swedes, with desired properties, in this region. Finally, the capacity of the swede to withstand modest, or even poor, growing conditions may have played a role as a trait for survival when more demanding vegetable crops made their entry in the southern parts of the country.

Collecting, collecting and... collecting

The Nordic Gene Bank - nowadays better known as the Nordic Genetic Resource Centre or NordGen - was established in 1979 as a regional collaborative initiative between the five Nordic countries. NordGen today holds c. 26 400 accessions that are accepted for long-term storage. Of the 117 swede accessions in total, 51 are of Swedish origin and 23 of these are classified as landraces or locally developed cultivars. Altogether 42 accessions are accepted for long-term conservation, while the remaining nine are stored temporarily.

While the majority of the accessions held by the genebank originate from breeders' collections, repeated collecting missions by the genebank curators throughout the years have managed to enrich the Nordic genetic material. The nation-wide "Seed Call" that went on during three years and searched Sweden from north to south yielded at least 15 hitherto unknown landraces of swede (Weibull et al. 2009). This means that the inventory expanded NordGen's collection by almost one third. Prior to that, the Swedish Seed Savers organization Sesam had for many years been conducting pioneering 'detective work' to track and identify heirloom cultivars of a broad range of vegetable crops, including swedes. Sesam has taken on as their main responsibility to produce seed of all maintained cultivars, to be shared among members of the association, and therefore collaborates closely with NordGen.

The observation that such a large number of unknown landraces or local cultivars of swedes were still grown and maintained in Sweden in the early 2000's came, as mentioned, as a surprise to many of us. Being a biennial crop, that flowers and sets seed only the second year following winter storage of the roots, means that maintaining the landrace is labour intensive. Still, the range of anecdotes to accompany the donated accessions revealed very close relationships between the crop and its caretakers, very often over several generations (Nygård and Leino 2013). While the Seed Call aimed at finding most of what was still grown "out there" in terms of unknown cultivated diversity, we cannot rule out that

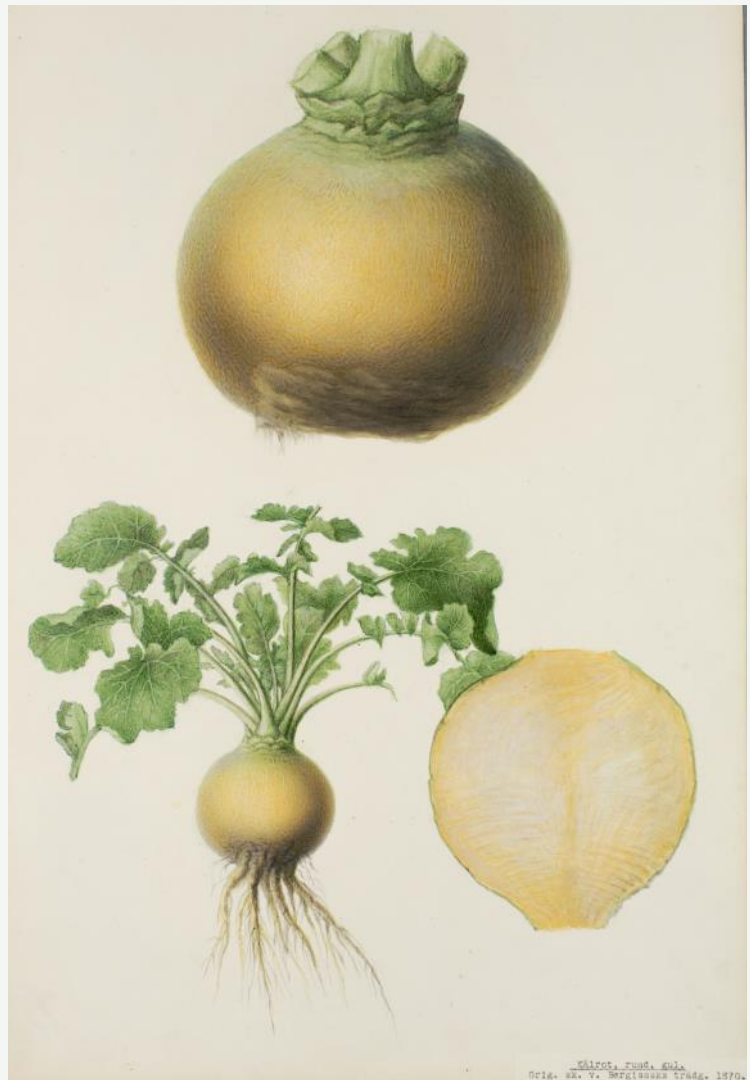


Figure 2. 'Swedish Yellow Swede', is considered as the cultivar being closest to the original swede. Illustration by Henrietta Sjöberg 1870. Photo: Kentaroo Tryman.

there might still exist landraces or local cultivars deserving to be collected. The time left for us to find them is running short, however, since many of the caretakers were elderly people already 15 years ago. Nonetheless, as late as 2018, another previously unknown swede landrace was identified (Magnusson, 2019).

Cultivation trials and tastings

The ambition of Kålrotsakademien - the swedish Academy (founded in 2015) is to show the diversity of the swede concerning shape, colour and eating experience. The efforts have given effect - the best chefs in Sweden ask for cultivar names, and they specify taste and texture properties of swedes. The country's largest producer of swedes has now chosen to grow the conservation variety 'Vintjärn', as a result of market demand. At the Nobel Prize Dinner of 2018, swede was on the plate. The swede's class trip is exceptional! How has this been possible?

"- What nobody knows about, cannot be asked for!" Kålrotsakademien - the swedish Academy took firmly on hold of this statement, and in 2018 all 50 accessions of Swedish origin that were available at NordGen were grown. The cultivation took place in Södermanland (about 150 km south of Stockholm) in light soil in a slight southerly slope. This particular year was characterized by severe drought, and thus frequently watered. The cultivation was covered with insect nets throughout the season (Figure 3). On two occasions characters were registered according to UPOV standards.



Figure 3. Test cultivation of 50 different accessions. Photo: Patrik Arneke.

The different accessions demonstrated a great variation for many characters. An obvious difference was that swedes of fodder type had a much later root development and generally produced larger roots. The susceptibility to mildew also differed markedly between the varieties.

The harvest from the test cultivation formed the basis for the "world's largest" palatability test of swedes at the Rutabaga restaurant, Grand Hôtel, in Stockholm in October the same year (Figure 4). Fifty volunteers tested all accessions and filled in forms for sensory mapping, prepared by researchers at Örebro University. A brief account of the event can be seen on YouTube (<https://www.youtube.com/watch?v=ZDZ0AB-bZyA>).

The test panel reported a very large, and pronounced, variation in taste, scent and texture. As a result of the sensory mapping, the tested swede accessions could be divided into the following three sensory groups:

- a) More woody, bitter and peppery, with a tinge of earth and stable. Less fruity, fresh, sweet, crispy and/or watery;
- b) Sweeter, firm, woody and fruity. Less tart, crunchy, peppery and/or bitter;
- c) More crisp, watery, fresh and tart. Less spicy, bitter, earthy and/or woody

The most highly rated swede of all was 'Nusnäs', a local cultivar from Dalarna in Central Sweden (Figure 5). To our surprise, many of the fodder swede roots received good sensory grades. We also noted that the variety lowest in rank in terms of palatability was the variety that completely dominates commercial production of swede in Sweden. We can now firmly argue that there are very many good alternatives.

Conservation, seed production and remarketing

Re-establishment of the swede on the market requires both that its value as food is restored and that seed is available. Seed production is perhaps the greatest obstacle. As mentioned earlier, the Swedish swede accessions are long-term preserved at NordGen. Here the accessions are preserved for future food supply and are mainly used for research and plant breeding. But it is also possible to order smaller seed quantities for further propagation. This propagation requires knowledge, space and time. Today, 4-5 000 tonnes of swede is produced commercially in Sweden (Statistiska centralbyrån, 2019). The production for own use is probably negligible. The number of varieties is low. Thus, there is potential for growing more varieties of different qualities since, with greater diversity, demand would be expected to increase, as would GDP (Gross Domestic Product).



Figure 4. Palatability test of 50 different swedes at the Rutabaga restaurant. Photo: Patrik Arneke



Figure 5. 'Nusnäs', a landrace from the province Dalarna, received most top scores at the palatability test. Photo: Patrik Arneke.

While we do not expect that production of these unique varieties would be comparable to the current commercial production of swede, we are certain that a larger assortment of varieties on the seed market could increase interest in home garden cultivation.

Whereas commercial production of swede for sale as a food crop is reasonably straightforward, seed production is more demanding. We know there is an interest, but even if these 'quality' varieties would generate a higher price than bulk seed, seed production is the one major challenge. To satisfy seed demand, a target for seed production could be 500 g-2 000 g seed per variety of between 10-20 varieties. While seed amounts available from the genebank produces 75-150 plants, there is a need to select among these plants to get healthy and good seeds. Each plant is expected to yield 20 g of seeds on average (George, 2009).

This way it should be possible to produce decent amounts of seed already in one generation (i.e. the second year after sowing) (Figure 6).

The difficulties with seed production are, however, several. The first, and most problematic, cumber is to engage growers who are willing to carry out this small-scale craft, yielding only limited amounts of seed. Another problem is that the swede is cross-fertilized and insect-pollinated. Being botanically speaking the same species as rapeseed, seed production in rapeseed districts is excluded. Risk of cross-fertilization also prevents the same grower from growing several varieties at the same time, unless each cultivar can be safely protected from pollinated insects.



Figure 6. Transplanting swedes from last year for seed production. Also rather small seed production plots can produce enough seeds for large scale cultivation. Photo: Linda Wiking.

Finally, due to current seed legislation, marketing requires that varieties are included on an official variety list. For these historical and unique varieties an option is to make use of the exception for so-called conservation varieties. The cost for listing is lower and registration is easier. Nonetheless, a seed grower can always expect some bureaucracy and it also involves restrictions on the amount of seed that can be sold. The new regulation 2016/2031 (EU) on protective measures against pests of plants may also affect the possibilities for small seed producers to make their seed cultivation profitable.

Today, six local Swedish swede cultivars are listed as conservation varieties and another two in preparation for application. Micro-volumes of seed from these have also been marketed. Although the seed prize is several magnitudes higher than for standard commercial varieties, the demand is much higher than availability.

Conclusions

The status of swedes has without doubt risen significantly in

recent years and the demand for traditional cultivars, with a cultural and local background, as well as specific sensory characteristics, is now large. We see this renaissance of a diminishing crop as the result of several parallel activities: the documentation and gathering of history and local cultivars, test cultivations, sensory profiling and the development of new cuisine using swedes. We further identify seed production as a critical factor. When the demand rises for local swede cultivars it is essential that seed production keeps pace and can provide seed before the momentum is lost.

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