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Exploring the hidden sensory potential of minor crops through archival search

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Exploring the hidden sensory potential of minor crops through archival search.

Global agrobiodiversity is declining, leading to food insecurity, loss of dietary diversity, and erosion of culinary heritage. Post-Green Revolution food systems have become homogenised, with up to 90% of global food production now relying on just 15 crops. Despite the existence of over 7,000 edible plant species, with over 417 being used as food crops, the agricultural shift has marginalised many minor and traditional crops and cultivars [1]. The unique sensory characteristics of these neglected crops, such as flavour and texture, are also largely overlooked, though they could be used to incentivise crop revival. The UK has the longest global history of modern agricultural development and arguably for losing its local agricultural and dietary diversity [2,3].

Globally, 710 gene/seed banks preserve plant genetic material, with 37% of accessions being of locally adapted landraces and many other traditional varieties. In the UK, seed banks like the HSL (Heritage Seed Library), JIC (Germplasm Unit by the John Innes Centre), and SASA (Science and Advice for Scottish Agriculture), along with smaller organisations, maintain around 327 landrace crops and many thousands minor cultivars. These are primarily used for research and *ex-situ* conservation [4-6]. Currently, there are around 8000 different crops and varieties that are legally available to growers through the NL (National Lists), however, nearly all of those are cultivars bred for modern agri-food characteristics, with minimal considerations toward agrobiodiversity.

Enhanced *in-situ* conservation and utilisation of underexploited landraces and other traditional cultivars, including appreciation of their sensory potential, are crucial to address food security challenges and preserve biodiversity. Leveraging hidden sensory characteristics could play a crucial role in facilitating the revival of these minor crops back into the food systems [5,6].

Rationale: Many interesting landraces and traditional varieties are maintained *ex-situ* in various seed banks and are likely to possess interesting sensory characteristics that could elevate their usability and acceptability across the food systems [3,4-6]. This study looked at the crop resources available on various UK platforms, seed banks' accessions and in the National Archives to assess the scope of potentially available resources for future sensory tests. A case study on peas (*Pisum sativum* L.) has also been conducted to narrow down the scope of the overarching study. The findings from this study were later used in sensory and texture analysis of excavated pea cultivars.

Project title: This poster is part of a PhD project titled: "Increasing food and nutrition security through the diversification of food supply chains with forgotten edibles".

Aim and objectives:

To conduct systematic searches on various secondary databases to assess the scope of forgotten crops with potentially overlooked sensory characteristics.

Scan for an overview of the data sources:



Methodology:

The methodology follows Yin (2018) protocol of archival resource screening [7]. UK databases were searched using specific Boolean codes to assess the extent to which minor vegetable crops are being overlooked in broader food systems. The extracted texts were analysed for specific descriptions indicating their minor statuses and potential for diversifying food systems through exploitation of their sensory characteristics. The data were analysed using IBM SPSS 28.0.1.0 and presented graphically.

Accession ID	Species	Cultivar/Variety	Origin	Country	Season	Quantity	Notes
J10799	<i>Pisum</i> (id#24199)	Goldkonig (1970)	Pis-sat	SWE	Spring	500	td-very shallow dentations on lower leaflets only.
J10800	<i>Pisum</i> (id#24200)	P. elatius (1970)	Pis-ela	SWE	Spring	100	
J10801	<i>Pisum</i> (id#24201)	Grauerbse (1970)	Pis-sat	SWE	Spring	500	from E. Akerberg Synonym: PI 27116
J10802	<i>Pisum</i> (id#24202)	Winges-37-red1-1 (1970)	Pis-sat	SWE	Spring	400	Synonym: 37
J10803	<i>Pisum</i> (id#24203)	WBH 680 (1970)	Pis-sat	SWE	Spring	420	
J10804	<i>Pisum</i> (id#24204)	P. tibeticum (1970)	Pis-sat_II	SWE	Spring	300	Lamprecht line received from von Rosen
J10805	<i>Pisum</i> (id#24205)	Wellensieks White Indent, di (1970)	Pis-sat	SWE	Spring	400	Wellensieks
J10806	<i>Pisum</i> (id#24206)	Navicula Apertus-nap (1970)	Pis-sat	SWE	Spring	420	
J10807	<i>Pisum</i> (id#24207)	Psativum-Turkey (1970)	Pis-sat	SWE	Spring	120	Synonym: L 2127
J10808	<i>Pisum</i> (id#24208)	Winter Hardy (1970)	Pis-sat	GBR	Winter	400	
J10809	<i>Pisum</i> (id#24209)	Winter Hardy (1970)	Pis-sat	GBR	Winter	400	
J10810	<i>Pisum</i> (id#24210)	Winter Hardy (1970)	Pis-sat	GBR	Winter	400	

Images 1: Example of information available on landrace seed banks' accessions.



Images 2-7: Exemplars of landrace legumes' accessions showing visual characteristics, sourced from various UK seedbanks.

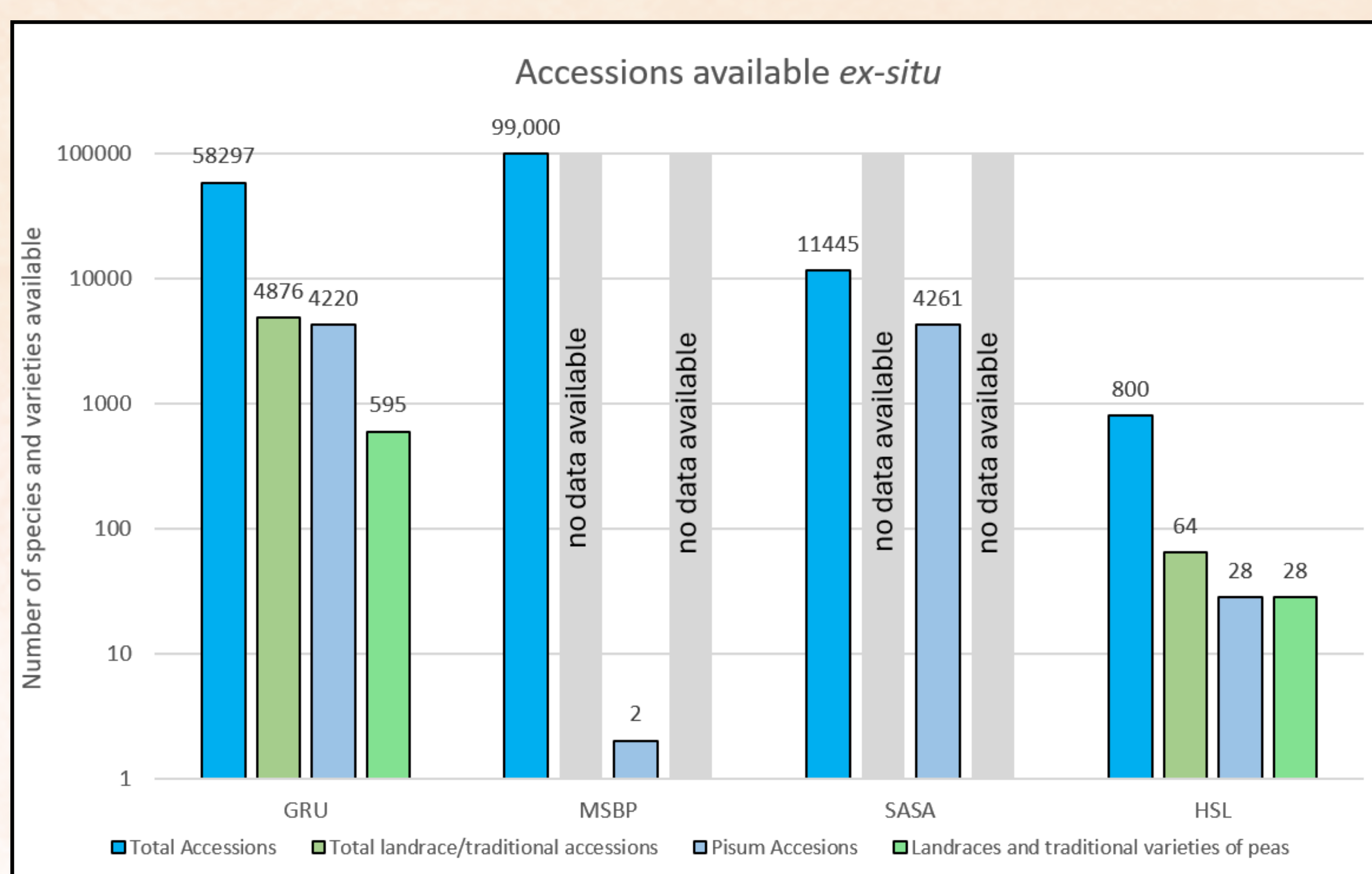


Figure 1: This bar chart shows the different types of crop accessions stored by the four main UK seedbanks. The landrace and traditional varieties might possess underexploited sensory characteristics.

Limitations and recommendations:

This study was based on archival searches only, with no evidence found in support of the existence of any unique sensory characteristics of these crops. Further studies should focus on accessions withdrawal and sensory testing.

Conclusions: Peas have been a staple in the UK diet for centuries, yet their diversity has diminished significantly due to the homogenisation of food systems and preference for *New World* crops, with most of current pea production being relegated to dietary accompaniments and animal feed. National archives reveal an overreliance on commercial *Pisum sativum* L. cultivars, with traditional landraces and varieties often overlooked. Despite their historical importance, these heritage crops are largely maintained *ex-situ* in seed banks with some *in-situ* preservation by small-scale growers. Barriers such as unclear legislation and limited access to genetic material hinder the use of traditional varieties. However, these neglected crops offer unique sensory characteristics that could be leveraged for more resilient food systems, warranting further exploration and integration into mainstream food production. Future studies should focus on accession withdrawal and sensory analysis and comparisons between landraces, traditional varieties and commercial grade cultivars to assess routes for their reintroduction into existing food systems.

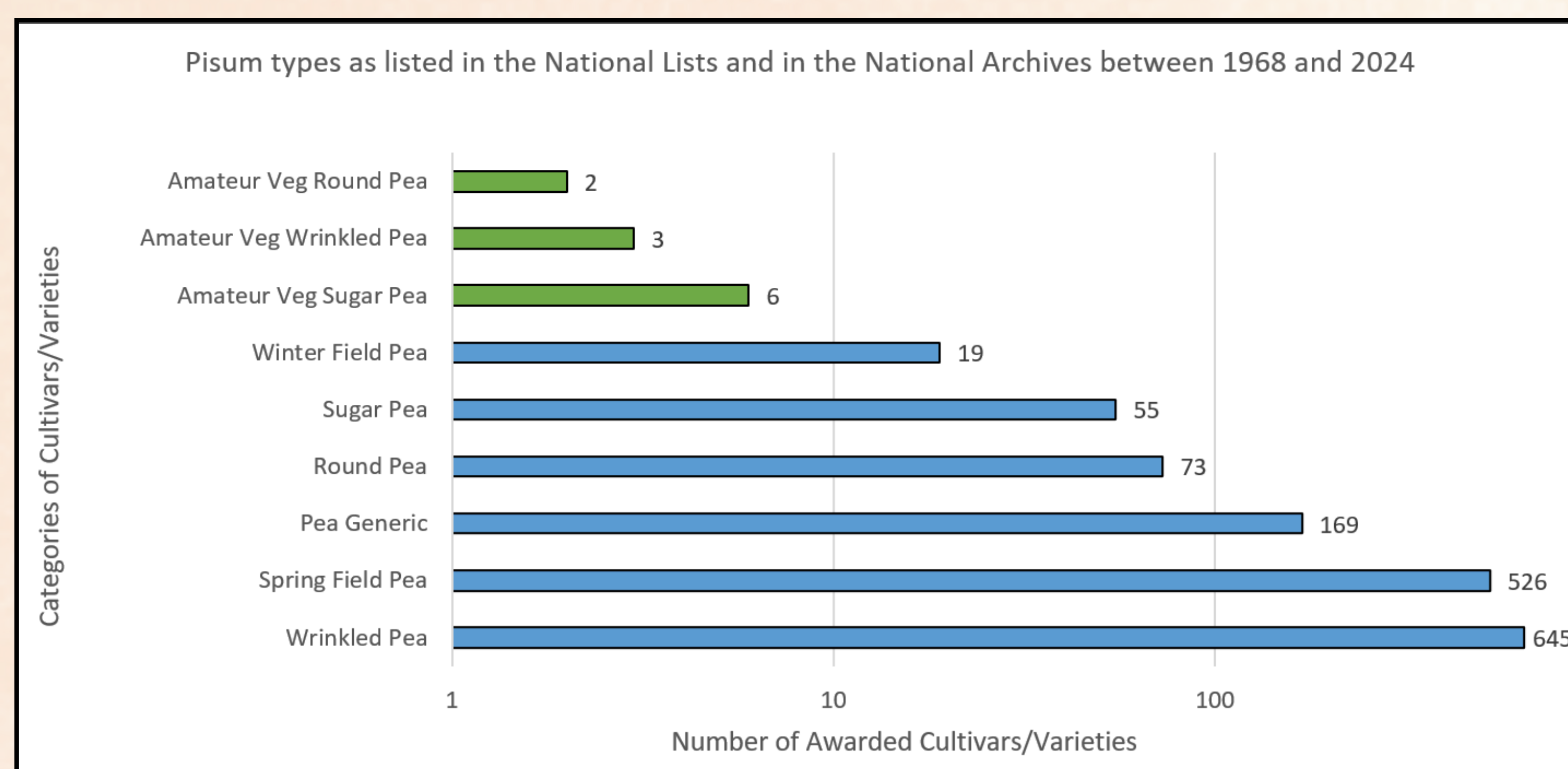


Figure 2: This bar chart shows the breakdown of different 'group names' for *Pisum sativum* L. as listed on the archives between 1968 and 2024, indicating the small number of traditional varieties that might possess underexploited sensory characteristics.

Findings summary:

Overall, there seems to be an enormous scope of landrace and traditional varieties of crops, including peas, that have yet to be tested for sensory characteristics. Many of these could possess sensory characteristics that could outcompete those found in their commercial relatives, incentivising the diversification of the food systems [10-14].