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RESEARCH ARTICLE

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Harnessing the nutritional potential of Cape wild edible plants: Insights, gaps and priorities

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Societal Impact Statement

Wild edible plants hold significant potential to strengthen food systems by enhancing nutrition, dietary diversity, climate resilience, sustainability and deeper connection of people to their food. In this study, we conducted a systematic literature review to identify knowledge gaps and assess the nutritional contributions of selected wild edible species from South Africa, compared with their commercial equivalents. We found that species from the Greater Cape Floristic Region are especially under-researched, yet several show strong potential to address regional nutrient deficiencies and often outperform commercial crops. These findings support targeted research, cultivation and policy efforts to (re)integrate priority wild species into resilient, locally adapted food systems.

Summary

- Wild edible plants of the Greater Cape Floristic Region (GCFR) of South Africa have piqued recent interest from multiple sectors for their potential to contribute to the Western Cape's food systems. However, cultivation efforts remain hindered by limited nutritional knowledge.
- This study uses a multi-methods approach. First, a systematic literature review establishes nutritional knowledge gaps and priorities for selected wild edible plants of the region. Existing nutritional data extracted from this review, alongside data from a global nutritional database, are then collated to summarise the nutritional contributions that these species can make to daily dietary requirements and their comparison to commercial equivalents.
- We find that winter rainfall/GCFR species are poorly researched and more so than summer rainfall species in terms of (a) nutritional status studied and (b) number of key nutrients tested in each species. We also identify key winter rainfall species (e.g. *Carpobrotus edulis*, *Mesembryanthemum crystallinum*, *Trachyandra falcata and Lycium ferrocissimum*) that show high potential to address nutritional deficits of the region. We find that wild edibles could play a role in addressing specific nutrient deficiencies of the Western Cape and often make nutritional contributions higher than that of equivalent commercial crops.

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- Although we find nutritional data to be sparse, that which exists suggests high nutritive potential of wild edible plants of the GCFR. We also identify priority species for future nutritional study and cultivation to enhance local food systems using the bounty offered by this biodiversity hotspot.

KEYWORDS
future foods, Greater Cape Floristic Region, indigenous foods, nutrition, Western Cape, wild edible plants, wild food plants

1 | INTRODUCTION

Wild edible plants offer immense potential to strengthen global food systems, making them more nutritionally secure, climate-resilient, sustainable and healthier. In areas where crop failures or food shortages occur, local wild edible plants serve as vital resources. At the same time, increasing the diversity of plants in diets is consistently associated with improved health outcomes across different regions and contexts (Gold & McBurney, 2012; Motti, 2022). Additionally, species adapted to local climates and soils are more likely to withstand climatic shocks and environmental changes, further enhancing their value in building resilient food systems. The adoption of wild edible plants also has additional societal benefits by empowering local market stakeholders and connecting consumers with producers, thereby reducing reliance on global value chains and enhancing food sovereignty (Borelli et al., 2020). This makes the preservation and cultivation of wild edible plants, particularly in biodiverse regions that are shown to coincide with high diversity in edible plants (Pironon et al., 2024), even more critical.

The Greater Cape Floristic Region (GCFR) in South Africa is, for its size, the richest extratropical plant biodiversity hotspot in the world. It supports approximately 11,423 species (Snijman, 2013), of which approximately 69% are only found in this region. Around 1740 of these species are edible plants, yet very few are regularly consumed or cultivated (Welcome & Van Wyk, 2019). Of concern is that approximately 25% of the total species from the GCFR are threatened in the wild (Rouget et al., 2014) due primarily to extensive habitat degradation and loss from urban and large-scale agricultural expansion. Invasive species encroachment is also a key threat, while climate change is identified as a significant future threat (DEA [Department of Environmental Affairs], 2013; Ziervogel et al., 2014). Hence, worries arise that these combined threats might diminish the cultural and practical worth of the region's edible plant diversity—a significant loss given their historical and potential future role in supporting livelihoods (Akinola et al., 2020).

For at least 160,000 years, the local inhabitants of the GCFR relied on foraging of the region's edible plants (Botha et al., 2020; Wehmeyer, 1986). The archaeological records even indicate that humans evolved to become modern based on their micronutrient and carbohydrate-rich diets drawn from the local landscapes (Singels, 2020, Singels et al., 2016). Post-colonially, local indigenous edibles of the region have become transposed by foods belonging to incoming food cultures, bringing with them the large-scale agricultural practices used to access them. Indigenous foods have become absent from the region's local foodways, supply chains and knowledge systems despite their ecological adaptedness, cultural relevance, deep historical ties with humanity and potential nutritional value (Uusiku et al., 2010). This absence has been less apparent for the indigenous edibles in the rest of South Africa, in the summer rainfall regions, where edible plants have been cultivated on subsistence scales and thus remained key food sources (Akinola et al., 2020).

Today, the socio-economic circumstances of the majority living in the Western Cape are resulting in childhood stunting among 21.4% of children under 5 years old [2017 data (UNICEF/WHO/World Bank, 2022)] and non-communicable lifestyle diseases being the cause of death among about 25% of the population in the Western Cape (Solomons et al., 2019), including but not exclusive to those living in poverty. Furthermore, past baseline studies have indicated poor iron (Motadi et al., 2023) and zinc status and vitamin A deficiency (Faber et al., 2011), as well as seasonal deficiency in vitamin D (Middelkoop et al., 2022). This places a burden on the province's health system. A question arises whether an opportunity exists to tap into the biodiversity of locally adaptive foods of the region to address nutrition deficits.

The recent resurgence of interest in foraging and using local wild edibles in the Western Cape, running parallel with international trends, has been supported through improved understanding of how to grow and use a selection of local edibles (Rusch, 2021, 2022; Willis et al., 2024). However, formalised cultivation efforts of GCFR species have remained slow. A key reason for this is a lack of knowledge, and synthesis of the knowledge that does exist, on the nutrition of these species. Setting strategic and informed priorities for cultivation has thus proven difficult so far. This lack of information not only limits the extent to which their uptake can be promoted for the purpose of improving health; it is also information that consumers as well as the public bodies controlling health and safety regulations require to be displayed on foods promoted or sold in formalised food systems.

Alongside identifying plants that could mitigate against nutrient deficiencies in the region, establishing a baseline understanding of nutritional status or data deficiency of wild edibles will promote the wider use of these species (e.g. uptake from professional cooks which could in turn support small-scale farmers), which will have knock-on economic benefits to society.

(A)



Tetragonia decumbens
dune spinach
Winter rainfall



Mesembryanthemum crystallinum
ice plant
Winter rainfall



Mesembryanthemum guerichianum
brakslaai
Winter rainfall



Mesembryanthemum cordifolium
sunrose
Summer rainfall



Mesembryanthemum vanrensbergii
sea pumpkin
Winter rainfall



Portulacaria afra
spekboom
Summer and bimodal rainfall



Asystasia gangetica
creeping foxglove
Summer rainfall



Trachyandra ciliata
veldkool
Winter rainfall



Trachyandra falcata
namakwakool
Winter rainfall



Trachyandra divaricata
sandkool

Winter rainfall



Cucumis africanus
wild cucumber

Summer rainfall



Citrullus lanatus subsp latus var citroides
makataan
Summer rainfall

FIGURE 1 (a) Leafy greens, succulents and vegetables. (b) Culinary wild herbs. (c) Soft fruits and drupes featured in this study (see Table S1 for additional common names). Photo credits: L. Rusch.

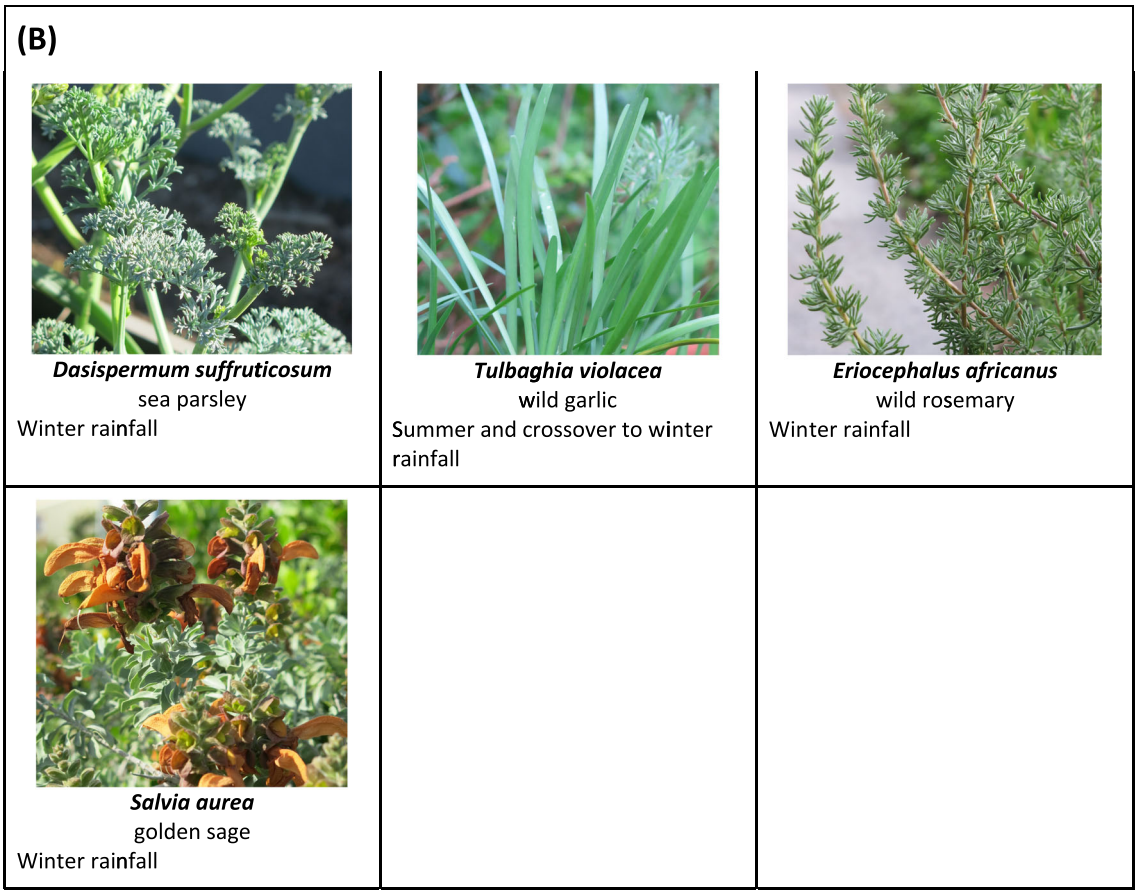


FIGURE 1 (Continued)

Our study contributes to these knowledge gaps by synthesising existing nutritional data, including an understanding of potential contributions to daily dietary requirements, on a selection of wild edibles growing in the GCFR of South Africa. Additionally, we aim to identify nutritional information gaps and, in so doing, establish priority species for cultivation and thus reintegration into the food and knowledge systems in the Western Cape. We therefore hypothesise the following:

1. Species indigenous to the winter rainfall/GCFR are currently significantly under-researched and under-published in terms of nutritional status (research effort and nutrients considered).
2. For those winter rainfall/GCFR species with existing data, nutritional potential is high and higher than commercially equivalent species.

This baseline study thus sets out to establish and present the current nutritional information status of a selection of 24 local wild edible plants growing in the GCFR. It therefore intends to serve as a baseline from which to expand future work in support of both traditional knowledge systems as well as the sciences being used to uphold the potential of GCFR local wild foods to make social and ecological impact.

2 | METHODS

2.1 | Species list

The species used in this study are those presented in the publications 'Cape Wild Foods: A Growers Guide' (Rusch, 2021) and 'Cape Wild foods: a Cooks Guide' (Rusch, 2022) and listed in Figure 1. The inclusion/exclusion criteria of species can be summarised as those species of leaf and fruit crops found in the GCFR that are suitable for growing at household and small-scale cultivation. Some are wild food plants not previously propagated or cultivated and until recently only occurring in the wild, while others are found propagated and for sale in nurseries and are grown in public as well as private gardens. Our study focused on leaf and fruit crops and excluded species with edible underground storage organs as options for cultivation, due to the longer time estimated from planting until harvest and the cost and effort requirements to reseed each year as the root stock is the consumed plant part. Finally, not all of the species in this study are endemic to the GCFR, with some occurring predominantly in the summer rainfall areas, but with crossover into the GCFR.



FIGURE 1 (Continued)

2.2 | Literature review

We conducted a literature review in the Google Scholar database to identify the most recent relevant advances in nutritional research (up until 15 August 2022) on the selected species (Figure S1). We used the following combination of search terms: [the name of each species] + "~nutrition". The total search hits were 17,148 titles. We read the top 20 most relevant papers (as defined by the Google Scholar algorithm of relevance) for each species. If there were very high numbers of papers, we focused on those between 2017 and 2022. If no papers were present, grey literature was also searched. From this reviewing process, we filtered this list to 89 papers that met the criteria of containing nutritional information for our species, resulting in 120 records of nutritional status, which were used to generate the database of nutritional status. We recorded the presence or absence of studies for each species. Upon identifying a study that presented data on nutritional status, we recorded this for the list of key nutrients (macronutrients: energy, protein, carbohydrates, fibre, fat, sugar; micronutrients: calcium, magnesium, zinc, iron, vitamin A, vitamin C, vitamin D, vitamin B9). If this first general search did not yield any information on these key nutrients, we expanded the search to [species name] + [key nutrient name]. Finally, we crossed our dataset with that of a global database of nutrients in food plants (unpublished; see Table S2 for list of sources) to fill any gaps from our literature review. This increased our number of unique records to 129 records of nutritional status in total.

2.2.1 | Analysis: Research effort

From our literature review, we recorded the overall research effort including the total number of search hits per species and compared the winter versus summer rainfall origin species data. From these data, we analysed the percentage of incidences of where the nutrient was studied proportional to the number of species of either winter or summer rainfall, which was considered so as to obtain a relative

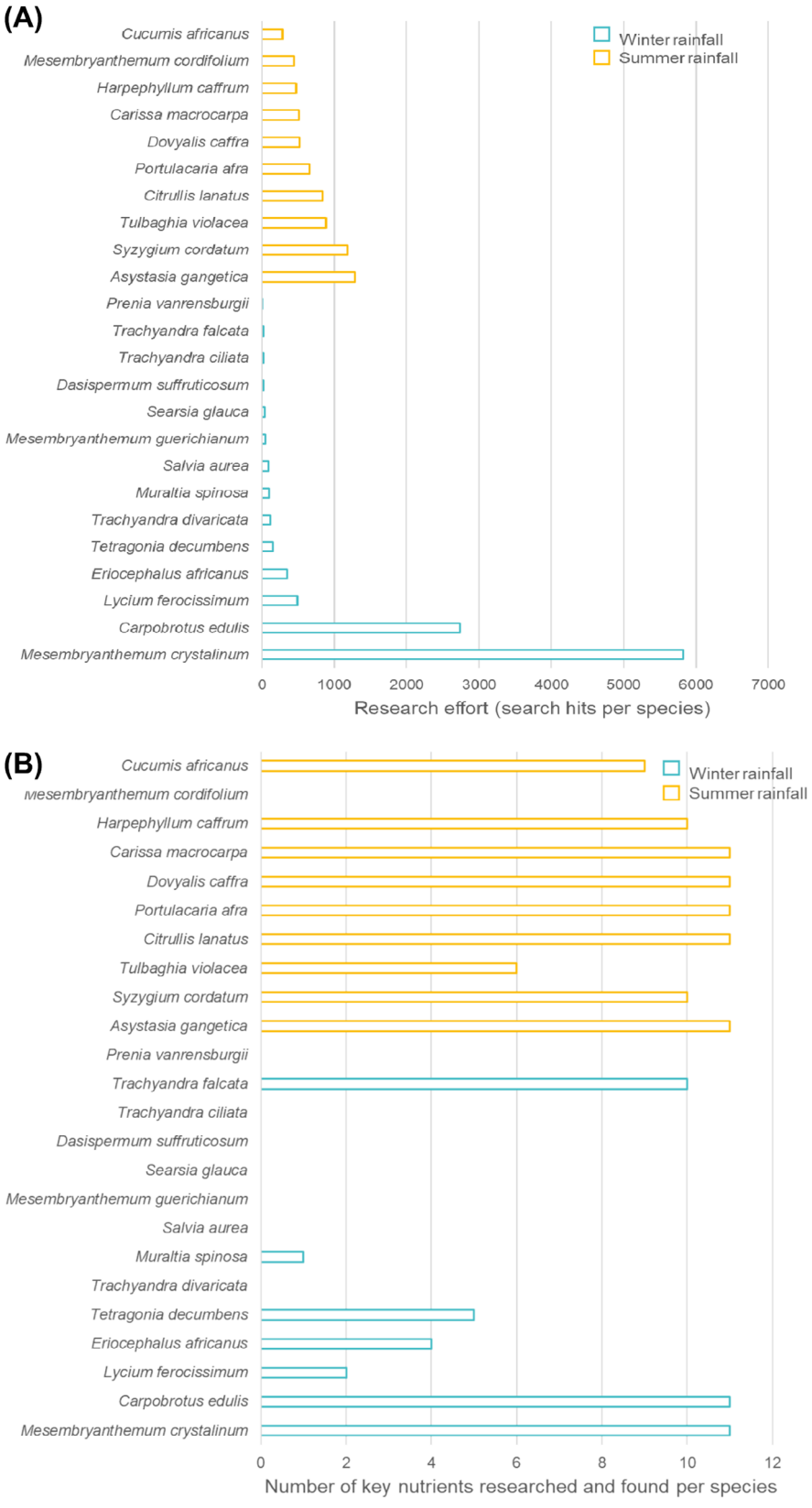


FIGURE 2 Research gaps for selected wild edible plants of winter versus summer rainfall regions of South Africa. (a) Research effort defined by the number of articles found (search hits) per species including the search terms of species name + ~ nutrition. (b) The coverage of key nutrients in existing literature as defined by the number of key nutrients researched per species.

percentage of research effort for each nutrient by summer versus winter rainfall.

2.2.2 | Analysis: Key nutrients

To compare existing ranges of nutritional values of key nutrients of those species studied, we conducted a comparative analysis among species. Those studies presenting data for a key nutrient of a species were recorded alongside the unit it was measured in and the region it is indigenous to (GCFR/winter rainfall vs. summer rainfall). For each record, we then standardised each key nutrient value to have the same unit. This was used to calculate the percentage contribution of a nutrient relative to the daily recommended intake (RDI, defined for an adult female from the British Nutrition Foundation) of that nutrient per portion of the species. The food portion used for this analysis for each species was determined by its category of being vegetable-like/succulent leaves/leafy greens (80 g average portion), fruit/drupe/berry (80 g average portion) or herbs/aromatics (10 g average portion).

In order to compare key nutrients of commercially equivalent foods, we extracted data from the USDA National Nutrient Database, which we then calculated percentage contributions to RDI in the same method as above. Key nutrient data from our focus species and their commercial equivalents were averaged to generate an overall mean nutrient index per species to be compared.

3 | RESULTS

3.1 | Nutritional research effort

Overall search hits suggest similarity between winter and summer rainfall species (average of 717 vs. 710); however, only two species (*Carpobrotus edulis* and *Mesembryanthemum crystallinum*) account for the majority of these search hits for winter rainfall species, whereas summer rainfall species tend to have more evenly spread hits, suggesting each species is more consistently studied (Figure 2a). Species that lack any data on key nutrients for diets include *Mesembryanthemum cordifolium* for summer rainfall species and *Mesembryanthemum vanrensburgii*, *Trachyandra ciliata*, *Dasispermum suffruticosum*, *Searsia glauca*, *Mesembryanthemum guerichianum*, *Salvia aurea* and *Trachyandra divaricata* (Figure 2b) for winter rainfall species.

Research into nutrients (and some anti-nutritional components) indicates overall less relative research for winter rainfall vs summer rainfall species (Figure 3) (winter rainfall species studies make up one quarter that of summer rainfall species for energy, carbohydrate, fat, sugar, calcium and manganese and one half that of protein, sugar, fibre, magnesium, zinc, iron, vitamin C, copper, chromium and phytochemicals). Notably, in both regions, iodine and vitamins D, B9, E and K are under-researched; however, no relevant data exist for winter rainfall species for these nutrients.

3.2 | Key nutrients: Nutritional values of key nutrients of those species studied

The results from the key nutrients analysis once again indicate that very little information exists on key nutrients for all species, with less data available for winter rainfall indigenous species. For summer rainfall species, *M. cordifolium* has no data on any key nutrients, whereas for winter rainfall species, there are seven species with no data on any key nutrients: *M. vanrensburgii*, *T. ciliata*, *D. suffruticosum*, *S. glauca*, *M. guerichianum*, *S. aurea* and *T. divaricata*. The two exceptions among the winter rainfall species where more data exist on key nutrients include *C. edulis* and *M. crystallinum*.

Overall, a large range of key nutrient values is present. From the little data that are available, there is some indication that species

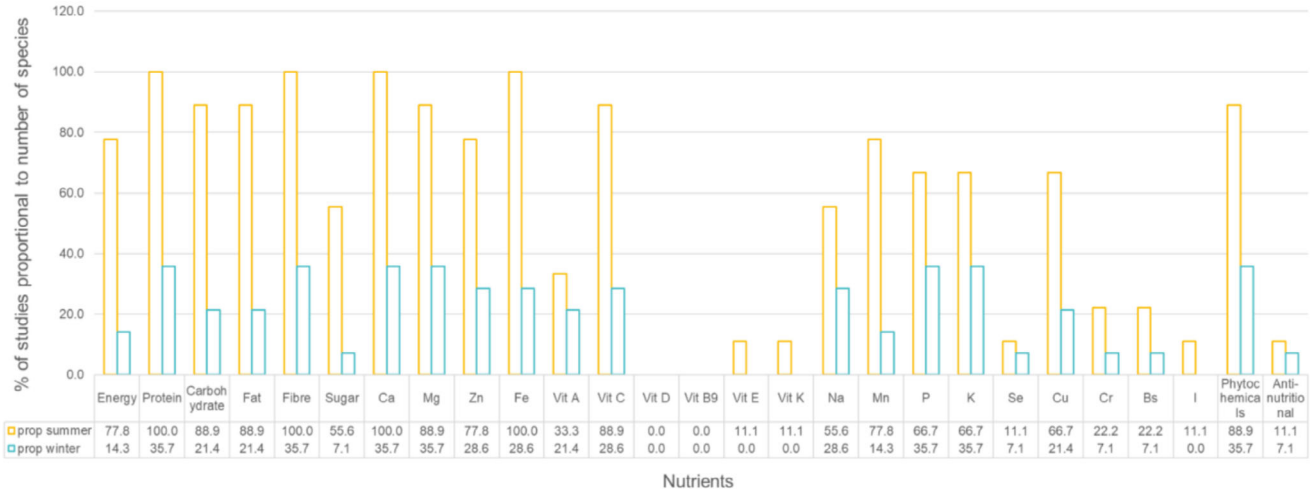


FIGURE 3 Research effort per nutrient relative to the number of species considered for that region (summer or winter rainfall) for which data existed. This is calculated as the percentage of incidences of a nutrient studied, proportional to the number of species considered for this region.

indigenous to the GCFR may have the potential to contribute to improving nutrition of diets (Figure 4). Examples include approximately up to ~24% of the daily recommended intake for energy per portion, ~10% protein, ~39% fibre, >100% vitamins A and C, >100% iron, >100% calcium, ~57% magnesium and >100% zinc in only one portion (for details, see Figures S2 and S3). Specifically, *M. crystallinum* also shows the potential of contributing 10%–45% of daily requirements of vitamin C (27 mg) per portion (80 g) (Figure S3). *C. edulis* shows potential for contributing per 80 g portion, an average of 6% energy, 6% protein, 39% fibre, 2% fat, 80% calcium, 52% magnesium, 19% zinc and 18% iron (Figures S2 and S3).

Results indicate that generally, vitamins and minerals are high in the species for which studies exist, in particular, *Carissa macrocarpa*, *C. edulis*, *T. falcata* and *T. violacea* (Figure 4). We also see that, despite few studies measuring vitamin A, all species show high nutrient levels i.e. above 100% of daily recommended intake requirements per portion (also see Figure S3). Further, results show that some species are providing a greater mix of nutrients, for example, *C. macrocarpa*, *C. edulis*, *T. falcata* and *T. violacea* (Figure 4). Relatedly, Figure 5 shows that *C. edulis* (a winter rainfall species) is the only species that provides all three nutrients (iron, zinc and vitamin A) identified as deficient in the Western Cape.

Finally, results of the mean overall nutrient index for all species in comparison to commercial equivalents indicated that wild edible plants across all food types had superior mean nutrition to their commercial counterparts (Figure 6). Furthermore, despite being underrepresented in data available, winter rainfall species indicated highest nutrition in the fruits, drupes, berries and seeds, the succulent leaves and the winter and spring vegetables food type categories.

4 | DISCUSSION

4.1 | Research effort and key nutrients and priorities

Our study shows a lack of knowledge in nutritional status of local winter rainfall wild edibles except for two key species. This has likely contributed to greater momentum and motivation to cultivate summer rainfall species in the Western Cape, even if there exists great nutritional

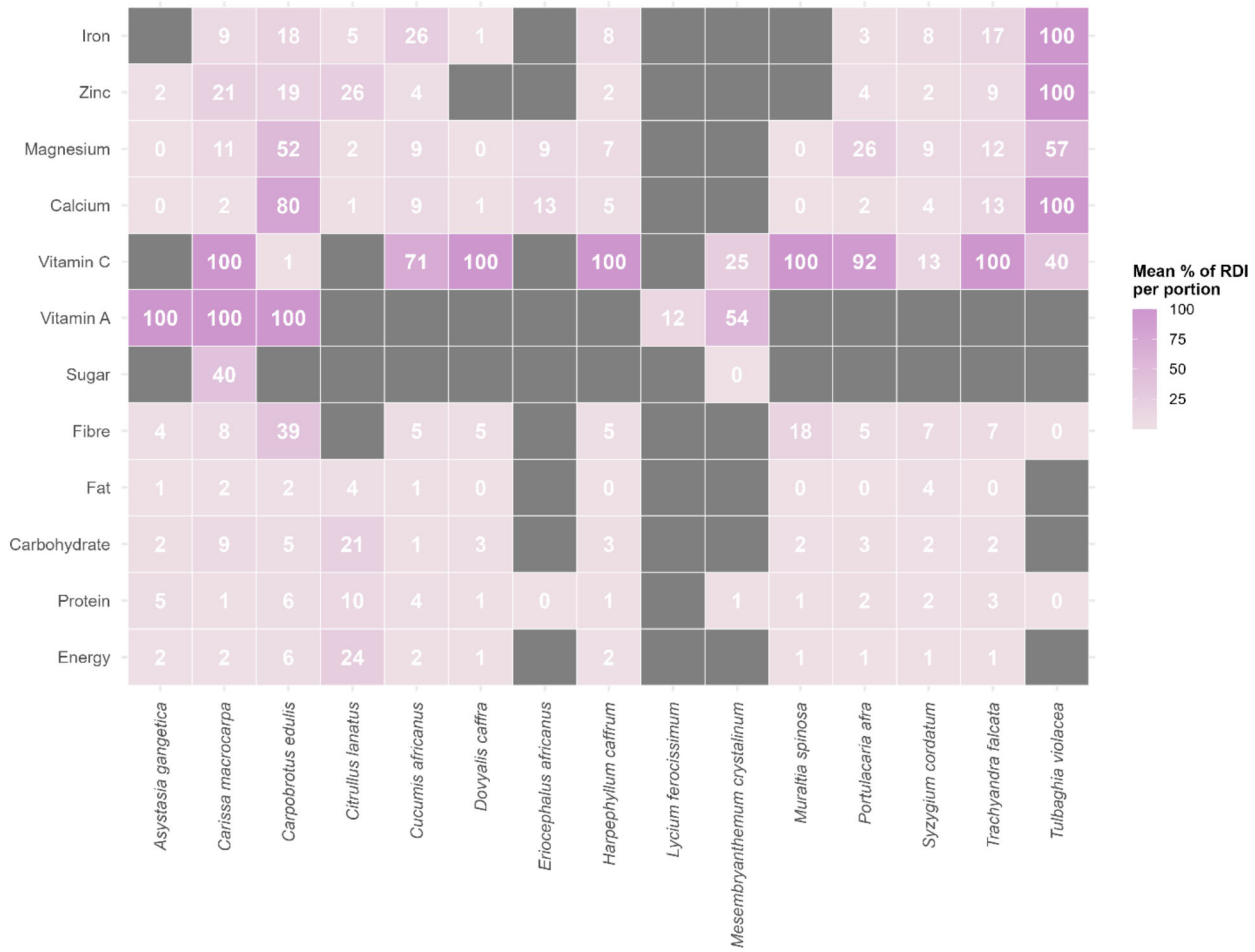


FIGURE 4 Heatmap indicating mean % contribution to recommended daily intake of nutrients per portion for each species from existing data. Where this percentage was over 100%, we have capped this to 100% for illustrative purposes. Grey cells indicate no data available. See Figures S2 and S3 to see full details.

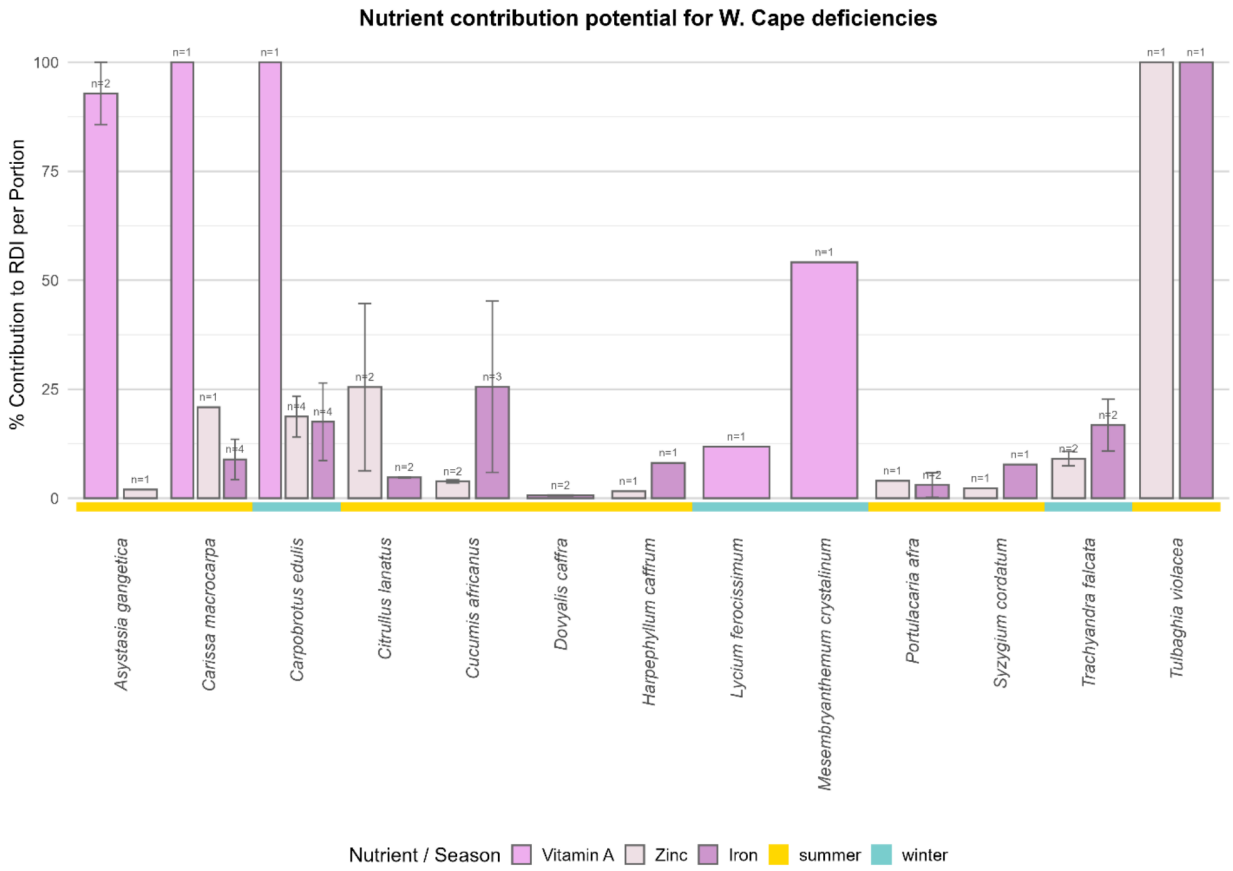


FIGURE 5 Mean nutrient contribution (%) + SE to daily recommended intake per portion for species with nutritional data for a subset of nutrients (vitamin A, zinc, iron) of known deficiencies in the Western Cape. Summer versus winter rainfall species denoted in the colour bar along x-axis.

potential in more locally adapted (water-wise, drought-tolerant and poor-soil-tolerant) species indigenous to the winter rainfall/GCFR. Our results therefore call for rapid upscaling of nutritional analysis on winter rainfall/GCFR species, as well as identifying priorities to establish baseline assessment of nutrition for those species with no nutritional data (e.g. *M. vanrensburgii*, *Tetragonia decumbens*, *T. ciliata*, *D. suffruticosum*, *S. glauca*, *M. guerichianum*, *S. aurea* and *T. divaricata* species) and those nutrients with no data (vitamins D and B9 for both regions and vitamins E, K and iodine for the winter rainfall region).

For those species with existing data, *Carpobrotus edulis*, *T. falcata* and two species categorised as summer rainfall but crossover to winter rainfall regions: *T. violaceae and C. macrocarpa* show both high levels of micronutrients and the greatest diversity of nutrients within a species (Figure 4) and thus present species with potential to address micronutrient malnutrition through their consumption. *Tulbaghia violaceae* is particularly interesting to study further because despite having only a single study presenting data, we see high nutritional contribution: Bvenura and Afolayan (2017) found that *T. violacea* shows potential significant contribution per 10 g portion consumed of vitamin C (40%), calcium (>100%), magnesium (57%), zinc (>100%) and iron (>100%). *Trachyandra falcata* shows potential significant contribution per 80 g portion consumed of protein (3%), fibre (7%), vitamin C (>100%), calcium (13%), magnesium (12%), zinc (9%) and iron (17%) (Figures S2 and S3). By extension, our results promote prioritisation of nutrient analysis for unstudied *T. ciliata* and *T. divaricata* due to relatedness to *T. falcata*, which likely have similar chemical properties. *Trachyandra* species have also been identified as having gastronomical potential as they have been written about from a culinary perspective frequently in the past five decades (Coetzee & Miros, 2009, 2015; Leipoldt, 1976; Rood, 2008; Rusch, 2021, 2022; van der Merwe & de Villiers, 2015).

C. edulis is one of the most studied species and shows great diversity and levels of nutrient contributions including for those nutrients of recognised deficiencies in the Western Cape (Faber et al., 2011; Motadi et al., 2023), for example, mean contributions to daily requirements of >100% vitamin A, ~19% zinc and ~18% iron in just one portion (Figure), alongside high levels of other nutrients (notably, 52% magnesium, 80% calcium and 39% fibre). This suggests (a) the general promise of similar winter rainfall species and (b) that this species specifically could make a good candidate for a cultivation priority, provided we can determine its market potential, as we are already equipped with good baseline nutritional knowledge. A recent review (Winstead & Jacobson, 2024) identified *C. edulis* as a promising cultivation option due to its ability to thrive in arid, salty soils unsuitable for most agriculture. Additionally, both its leaves and flowers are edible, offering more than just the typically consumed fruit. Interestingly, there are more data on nutritional content of their leaves, and this is the data included in our analysis.

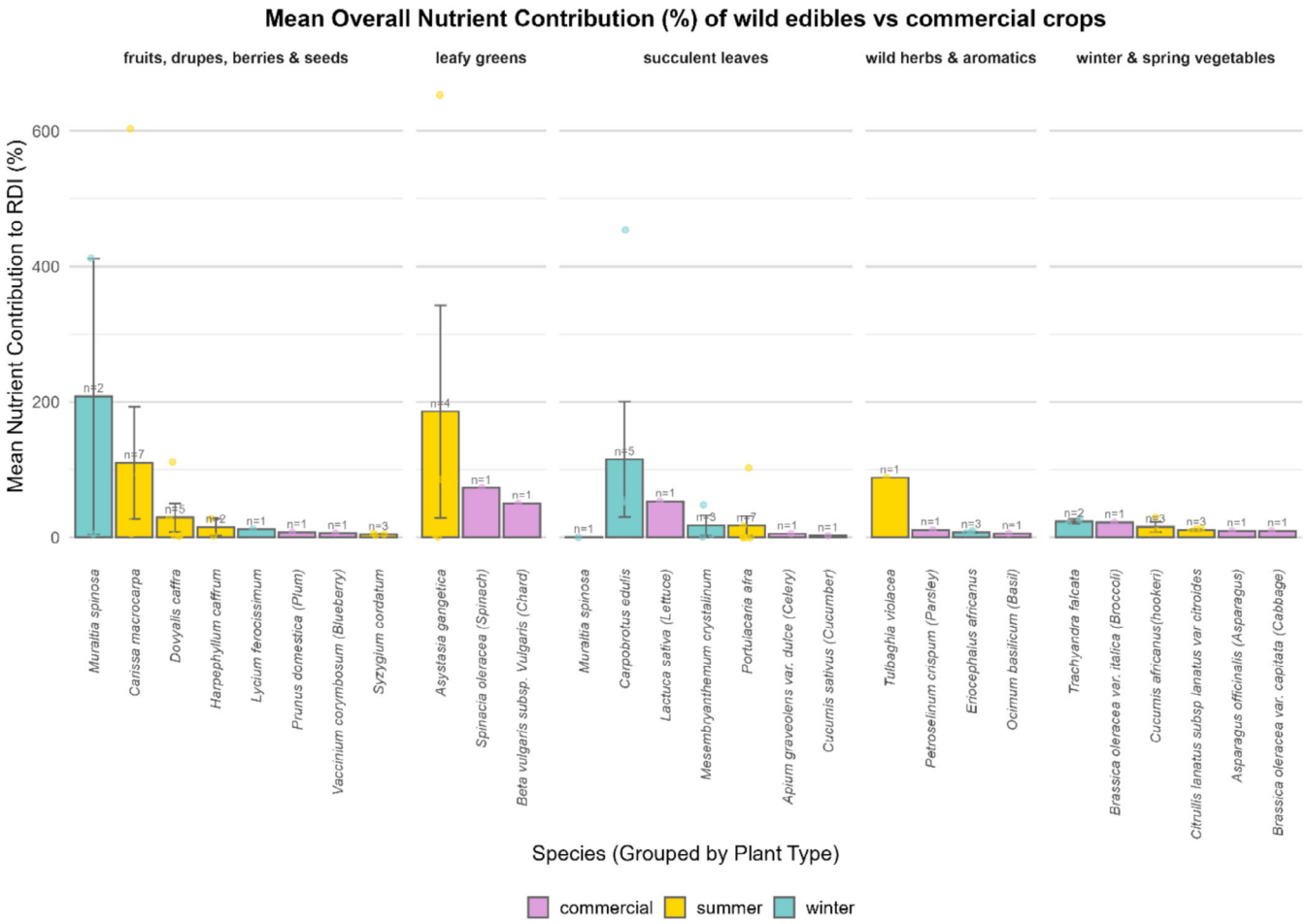


FIGURE 6 Mean (±SE) overall nutrient contribution (bars) and raw data points (points) to recommended daily intake (RDI) % for winter and summer rainfall wild edible species vs commercial equivalents of key macro- and micronutrients (energy, protein, carbohydrate, fat, fibre, sugar, vitamin A, vitamin C, Ca, Mg, Zn, Fe) grouped by plant food type. Points show individual observations and sample sizes are indicated above bars.

In terms of nutrient coverage per species as well as across species, our results identify some knowledge gaps. In the case of *M. crystallinum*, there are only data for five out of 14 key nutrients. As this is a widely foraged and well-liked species (Rusch, 2021, 2022), a focus on other key nutrients including energy, carbohydrates, fibre, fat, zinc and iron will be key for future studies on this species. Across species, vitamin A warrants further investigation because contributions were mostly well over 100% per portion (*Asystasia gangetica*, *C. macrocarpa*, *C. edulis* and 54% *M. crystallinum* Figure 4). Furthermore, vitamin D requires particular attention for the region, as it is a known seasonal deficiency (Middelkoop et al., 2022), but there was not a single study looking at this in species grown in the region.

4.2 | Wild edible plants versus commercial equivalents

One of the key findings of this research is that these wild edible species showed higher mean nutrient contributions to recommended daily intake than commercially equivalent species across plant food types (fruits, drupes, berries and seeds; leafy greens; succulent leaves; wild herbs and aromatics; and winter and spring vegetables). Seemingly highly nutritious foods, blueberries and plums were outshone by *M. spinosa* and *C. macrocarpa*. Spinach and chard were outclassed by *A. gangetica*, as another example. This suggests the promise of these wild edible species to fill nutrient gaps in our diets, increase dietary diversity and localise food and nutrition security solutions while maintaining local biocultural practices and knowledge systems.

4.3 | Why is it important we fill these gaps?

Species from this list show significant contributions to daily requirements of micronutrients such as calcium, magnesium, zinc, iron and vitamins C and A, of which zinc, iron and vitamin A were identified by Faber et al. (2011) as key deficiencies for the region. The feasibility of these species as potential solutions to nutrient deficiency will critically depend on consumer preference, their existing cultivation or the potential for easy household cultivation or sustainable harvesting. It is

therefore key that we extend existing nutritional research for the edible plants grown in the Western Cape.

Addressing the knowledge gaps we identify in our study will also support the reintegration of these species into local foodways towards achieving economic, social, developmental and ecological goals. Enhanced nutritional understanding of these species will ensure that it is possible to promote their uptake in homes by citing their health benefits in a targeted and informed manner. Greater market availability through food retailers (e.g. OZCF Market, Harvest of Hope, Living Soils) and restaurants will in turn stimulate income for the early adopter small-scale farmers taking up growing these plants (Zhang & Dannenberg, 2022). Improved nutritional knowledge is also relevant in enabling policy to promote scaling the emerging innovation methods aimed at ensuring sustainable, regenerative and climate-resilient cultivation. Socially and ecologically speaking, scaling the use of locally-adaptive low-resource-use indigenous foods along with their understood nutritional benefits can contribute to reducing the negative impacts on people's health and the region's natural environments that mainstream crops are implicated in.

4.4 | Study limitations and future work

The absence of nutritional data identified in our study indicates a need for additional resources to further investigate the potential of local wild edible plants in addressing nutritional insecurity in the Western Cape. This will involve securing funding for targeted nutritional chemical analyses, but we should also explore alternative methods. For instance, innovative prediction methods for nutrients used by Cantwell-Jones et al. (2022) for vitamin B prediction using phylogenies could be an initial step in pinpointing which species warrant further analysis. In fact, two priority species identified by our study, *T. falcata* and *T. violacea*, were predicted by Cantwell-Jones et al. (2022) to have high levels of vitamin B, a nutrient commonly deficient but key for a healthy nervous system.

A further limitation that requires some attention is the standardisation of nutrient data reported in these studies. Protocols and units varied per study, making it difficult to compare certain studies, and many had to be excluded as a result of poor reporting/lacking units. Our study therefore calls for a standardisation in protocol and reporting for nutritional analysis to advance this field of study and thus the impact this research can have for reintegrating these species into food systems as nutrition security solutions.

Due to the region's very high biodiversity, there are many more potential candidates to assess for their nutritional value that were not included in this study. For example, there are ~300 species of *Searsia* that occur across South Africa, of which some have been cited as used historically in ethnobotany records (De Vynck, Van Wyk, & Cowling, 2016) and found occurring at archaeological sites of habitation (van Wijk et al., 2017), thus indicating that these species are likely to be nutritious. They are related to Mediterranean sumac, which is a widely used spice. Similarly, there are multiple species of *Tetragonia* widespread across winter and summer rainfall regions and found in ethnobotanical records (van Wijk et al., 2017), which are not only recognised as edible by rural communities but are also favoured by animals, suggesting potential use as animal fodder (Personal observations by author L. Rusch). As identified in our study, *Trachyandra* species beyond *T. falcata* warrant further investigation due to the gastronomic familiarity of these species being prepared and eaten in a similar manner to asparagus or long-stem broccoli (Rusch, 2022) as well as early evidence of ease of cultivation (Rusch, 2021). Despite their longer time from establishment to harvest, species with edible underground storage organs indicate high nutritional potential (De Vynck, Cowling, et al., 2016; Singels et al., 2016), and greater persistence after wild harvesting than expected (Botha et al., 2022), and thus require further examination for nutritional and cultivation potential.

A key element required to reintegrate the species we identify in this study as having nutritional potential and which is still largely lacking is a comprehensive understanding of the market potential or consumer preference or value of species. Recent research (Zhang & Dannenberg, 2022) identified challenges for the marketisation of these species including limited seed/cutting access for growers, limited capacity of growers, competition with subsidised conventional production and limited distribution options. However, this study also highlighted the great potential for income generation and environmental adaptation that these species present.

This links to the final consideration that will be required to upscale this work and ensure its long-term sustainability: to understand the climate change resilience of these species. It is already expected that these species may outperform conventional crops due to inherent adaptations to drought, poor soils and fires that characterise the region. This will become increasingly important under projected increased intensity of droughts and fires and overall aridification of the Western Cape in the future. It will be important to quantify this resilience per species through a multipronged approach of understanding future suitability through species distribution modelling as well as through cultivation trials simulating varying conditions of the future. Currently, there is a lack of understanding about the climate change resilience of most edible species in the region. However, there are promising signs from both modeling, which predicts an increase in species richness of wild food plants despite habitat suitability declines, and cultivation studies, such as *M. crystallinum* and *T. decumbens*, which show resilience to water stress (Tembo-Phiri et al., 2019).

Through this process of quantifying the potential of species as future food solutions, caution must be taken when highlighting their potential to avoid promotion of unsustainable harvesting through foraging. Our recommendations are therefore aimed through a lens of upscaling subsistence growing and establishing cultivation for marketisation in order to protect species populations in the wild, rather than exacerbate conservation concerns for the region by encouraging unsustainable foraging. However, in some species contexts, sustainable wild harvesting could provide benefits to surrounding communities without conservation threat and would therefore be a valuable solution.

5 | CONCLUSIONS

There are a number of species grown in the GCFR that are key for further nutritional analysis due to their potential nutrient contribution despite zero or limited nutritional assessments. Those species indigenous to the winter rainfall/GCFR are particularly under-researched despite evidence suggesting their high nutritional potential (e.g. *T. falcata*).

We identify *C. edulis* as a key indigenous species to most imminently prioritise for future cultivation and marketisation because there is comprehensive knowledge of its nutritional status that shows that it has high nutrition.

However, it is likely a combination of species of those grown in the GCFR, including the understudied indigenous species that will provide key resources for addressing nutritional security of the Western Cape. We have demonstrated that within these wild edibles, there are opportunities to address nutritional deficits in the region (e.g. *C. edulis*, *T. violacea*, *C. macrocarpa*, *A. gangetica* and *M. crystallinum* providing significant contributions of vitamin A, zinc and iron) and that wild edibles offer higher nutritional contributions than commercial counterparts. It is thus critical to expand this research to determine opportunities for marketisation and cultivation, recognising that highlighting species should not encourage new foraging, if not deemed appropriate due to conservation concern, so that we can sustainably use and preserve the region's unique edible biodiversity.

AUTHOR CONTRIBUTIONS

Laura Pereira, Loubie Rusch and Nicola Kühn conceived the study. Michelle Delport, Nicola Kühn, Frances Storey and Emma van der Meulen collected the data. Nicola Kühn analysed the data. Nicola Kühn drafted the manuscript. Nicola Kühn, Laura Pereira and Loubie Rusch edited the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

Data used to generate this analysis are available from the authors upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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