Short Communication: Ethnobotanical study of wild and cultivated vegetables in the Eastern Cape Province, South Africa

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Abstract. Maroyi A. 2020. Short Communication: Ethnobotanical study of wild and cultivated vegetables in the Eastern Cape Province, South Africa. Biodiversitas 21: 3982-3988. Vegetables are an important component of agricultural biodiversity required for providing a wide range of ecosystem goods and services. The current study was undertaken in the Eastern Cape Province, South Africa to document wild and cultivated vegetables. Research data were collected by means of interviews and field surveys carried out in different seasons with one hundred and thirty-eight randomly selected participants. During the interviews, we documented information on names of edible vegetables, uses, plant parts consumed, and their preparation. A total of 32 species belonging to 26 genera and 15 families were recorded in the study area. The plant families with highest number of vegetable species were Amaranthaceae, Asteraceae, and Solanaceae with at least four species each. The main uses of vegetables identified in the study area were leafy vegetables (59.4%), edible fruits and tubers (21.9% each), culinary herbs or spices (12.5%), edible seeds (9.4%) and edible stems (6.3%). The species which were categorized as important with relative frequency of citation (RFC) values >0.3 were Brassica oleracea, Solanum tuberosum, Cucurbita moschata, Spinacia oleracea, and Cucurbita maxima. Both vegetable species collected from the wild and conventional vegetables cultivated in home gardens are important to livelihoods needs of the local people.

Keywords: Agricultural biodiversity, food security, livelihoods, Eastern Cape Province, South Africa, vegetables

INTRODUCTION

Plants are essential for human nutrition and as sources of energy. Bennett (2010) argued that humans obtain 85% of their calories from 20 plant species while more than 50% of their calories are derived from three plant species only, namely Oryza sativa L. (rice), Triticum aestivum L. (wheat) and Zea mays L. (maize). But in sub-Saharan Africa and other marginal environments of developing countries, there are several edible plant species often collected from the wild or grown in home gardens. Research by Maundu et al. (2009) revealed that there are about 1000 plant species in sub-Saharan Africa that are used as vegetables, with 80% of these being leafy vegetables and the rest are cultivated or collected from the wild for their edible fruits, seeds, roots and tubers, stems and flowers. A growing body of literature suggests small to medium-sized farming communities in remote and marginal areas have significant number of agricultural biodiversity required for food security and the wider provisioning of crucial ecosystem goods and services (Kumar and Nair 2004; Clarke et al. 2014; FAO 2019; Thorn et al. 2020). According to FAO (2001), food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life. Access to sufficient, safe, and nutritious food means that households must have adequate resources either to produce food in different farming systems or to obtain the food in exchange for cash or other commodities.

The significance of ecosystem goods and services provided by vegetables to community livelihoods is appreciated throughout the world (Afari-Sefa et al. 2011; Keatinge et al. 2011; Ebert 2014; Ojiewo et al. 2015; Ochieng et al. 2017). Towns and Shackleton (2018) argued that these different species of vegetables contribute to the dietary diversity, and are an important part of alimentary traditions, cultural identity of local communities in sub-Saharan Africa and make significant contribution to the development of agricultural biodiversity, but have suffered as neglected and underutilized species. These vegetable species have potential to be developed into new crops through domestication and their documentation is necessary for the identification of food sources from different environments and regions in order to serve as gene pools for genetic improvement of crops to achieve higher productivity, disease resistance and compatibility with global climate change (Turner et al. 2011; Ju et al. 2013; Abbet et al. 2014; Das et al. 2016; Aryal et al. 2018; Shin et al. 2018). There is now a general consensus that vegetables and other wild edible plants play an important role to the food basket in much of the developing world (Rubatzky and Yamaguchi 1997; Sundriyal et al. 2004; Ali–Shtayeh et al. 2008; Misra et al. 2008; Menendez-Baceta et al. 2012; Thakur et al. 2017; Bhatia et al. 2018; Chauhan et al. 2018) and leafy wild vegetables and fruits
are an important source of food during drought periods when the staple crops fail (Shin et al. 2018; Ojelel et al. 2019).

There is growing interest on vegetables since daily diet of fruits and vegetables is strongly associated with improved gastrointestinal health, reduced risk of heart diseases, stroke, chronic diseases such as diabetes, eye problems and various forms of cancer (Heinrich et al. 2005; Leonti et al. 2006; Dias 2012; Romojaro et al. 2013; Rush et al. 2018; Sansanelli et al. 2018). Similarly, Schreinemachers et al. (2018) argued that vegetables are the most affordable food source of vitamins and minerals needed by humans for good health. It is, therefore, within this context that this study was undertaken focusing on wild and cultivated vegetables in the Eastern Cape Province, South Africa. The term vegetable is defined as an annual or perennial horticultural crop with its parts such as roots, stalks, flowers, fruits, and leaves that can be consumed wholly or partially in raw form or after cooking (Welbaum 2015; Ülger et al. 2018). This knowledge on vegetables is important for preservation of ethnobotanical knowledge as part of the cultural knowledge and practice of local communities. Therefore, the aim of this study was to assess diversity, use categories, and local knowledge of both wild and cultivated vegetables in the Eastern Cape Province in South Africa.

MATERIALS AND METHODS

Study area
The study was conducted in three local municipalities in the Eastern Cape Province in South Africa, namely Elundi, Mbhashe, and Raymond Mhlaba Local Municipalities (Figure 1). The area is characterized by a subtropical climate with cold and wet winters, and warm and wet summers. Annual temperatures range from 4 °C in winter to a maximum of 40 °C in the summer (Jari and Fraser 2012; Hosu et al. 2016; Ndhlevu et al. 2017). The study area experiences an annual rainfall ranging from 550 mm to 1000 mm (Manyevere et al. 2014; Hosu et al. 2016; Ndhlevu et al. 2017). The local residents also rely on natural plant resources and the surrounding environment for a diversity of livelihood needs (Alexander et al. 2015) in addition to subsistence agriculture and migrant labor. The general livelihood system in the study area can be described as a mixed farming system, with residents engaging in both crop and livestock farming. Crop production is mainly through irrigation and rain-fed farming and some of the cultivated crops include maize (*Zea mays*), sorghum (*Sorghum bicolor* (L.) Moench), potatoes (*Solanum tuberosum* L.), cabbage (*Brassica oleracea* L.), spinach (*Spinacia oleracea* L.), beetroot (*Beta vulgaris* L.) and carrots (*Daucus carota* L.) (Ndhleve et al. 2013). The most common livestock species in the study area include cattle, chickens, donkeys, goats, horses, pigs, and sheep (Mapekula et al. 2009; Fayemi and Muchenje 2014; Mthi et al. 2017). Other sources of livelihoods include temporary employment, art and craft activities, social grants, and remittances from family members working in towns. The grassland biome and succulent thicket are by far the most dominant biomes in the study area (Mucina and Rutherford 2006).

Figure 1: The geographical position of the study sites in relation to other provinces in South Africa
**Data collection**

Data on the diversity of wild and cultivated vegetables in the Eastern Cape Province were collected by means of interviews and field surveys carried out in different seasons, that is, winter and summer. One hundred and thirty eight (Table 1) randomly selected participants took part in this study conducted between March 2012 to March 2017. This study utilized the participatory rural appraisal (PRA) methods (Chambers 1994), focusing on in-depth discussions using open-ended questionnaires and participant observation with local communities in data gathering. Interview discussions took place in the local language, isiXhosa, and were translated into English with the help of an interpreter. During the interviews, we documented information on names of edible vegetables, uses, plant parts consumed, and their preparation. Plant species were identified in the field and the taxon names conform to those of Germishuizen and Meyer (2003). The majority of these participants (65.9%) were females and their age range was from 19 to 81 years (Table 1). More than 80% of the participants live below the national poverty line and 62.3% of the households had total income of less than R1000.00 (US$87.00) per month. Close to three-quarters of the participants (73.9%) were unemployed, with 63.0% surviving on social grants (Table 1).

**RESULTS AND DISCUSSION**

**Diversity of edible vegetables**

A total of 32 plant species belonging to 26 genera and 15 families were recorded in the Eastern Cape Province (Table 2). More than three-quarters of the documented vegetables (81.3%) are from nine families, namely Asteraceae, Solanaceae, Amaranthaceae, Amaryllidaceae, Apiaceae, Araceae, Brassicaceae, Cucurbitaceae, and Fabaceae (Table 3). The other plant families were represented by one species each. Similar research by Achigan-Dako et al. (2011) focusing on diversity of vegetables in Benin revealed dominance of species belonging to families Amaranthaceae, Asteraceae, Cucurbitaceae, Fabaceae and Solanaceae. Moreover, the major families identified in this study are among the largest plant families in South Africa characterized by more than 50 species each (Germishuizen and Meyer 2003). Some of the vegetable species belonging to families Amaranthaceae, Amaryllidaceae, Apiaceae, Araceae, Asteraceae, Brassicaceae, Cucurbitaceae, Fabaceae, and Solanaceae are included in the book "Plant Resources of Tropical Africa 2: Vegetables", a monographic guide to the most commonly used vegetable species in tropical Africa, including their botany, distribution, main uses and phytochemical properties (Grubbén and Denton 2004).

More than three quarters (81.3%) of recorded vegetables are exotic to South Africa with the exception of Catha edulis (Vahl) Endl., Centella coriacea Nannf., Mentha longifolia (L.) Huds., Portulacaria afra Jacq., Solanum retroflexum Dun. and Zantedeschia aethiopica (L.) Spreng. Turreira-García et al. (2017) argued that presence of 55.0% exotic leafy vegetable species in Thailand serves as confirmation of international crop exchange in that country. Similarly, Maundu et al. (2009) argued that exotic species reported in this study such as Cucurbita maxima Duchesne and C. moschata Duchesne ex Poir. are originally from South America and now widely cultivated in tropical Africa for their edible fruits and leaves. In previous research focusing on edible vegetables in the KwaZulu-Natal province in South Africa, Ntuli et al. (2012) revealed that 47.0% of the documented species were exotic to South Africa. The authors argued that indigenous knowledge systems of local communities in KwaZulu-Natal province are dynamic and usually incorporate exotic species as new food sources.

| Socio-economic variable   | Value  |
|---------------------------|--------|
| Gender: Female            | 65.9%  |
| Male                      | 34.1%  |
| Age                       | 19-81 years (median 57 years) |
| People living in poverty  | 80.4%  |
| Household income           |        |
| (<R1000.00, US$87.00)     | 62.3%  |
| Unemployed                | 73.9%  |
| Dependent on social grants | 63.0%  |
| Household size             | 1-12 people (average 4.5) |

**Table 1. Socio-economic characteristics of the study sample, n = 138**
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and seeds, and culinary herbs or spices (Figure 4). In the present study, the ICF values for the documented vegetables ranged from 0.21 to 0.71 (Table 4). The highest agreement between the participants was observed for leafy vegetables while the least agreement was for edible stems (Table 3).

Interviews with participants revealed that species like *Rumex lanceolatus*, *Solanum nigrum*, *Taraxacum officinale*, and *Zantedeschia aethiopica* were rarely eaten by the local inhabitants, while conventional cultivated vegetables like *Brassica oleracea*, *Solanum tuberosum*, *Cucurbita moschata*, *Spinacia oleracea*, and *Cucurbita maxima* were preferred and, thus, scored higher RFC values (Table 2). The exotic vegetable species such as *Brassica oleracea*, *Solanum tuberosum*, *Cucurbita moschata*, *Spinacia oleracea*, and *Cucurbita maxima* are well-known food plants cultivated throughout the world (Semenya and Maroyi, 2020). Kahane et al. (2013) and Caballero-Serrano et al. (2016) argued that indigenous and wild species are less attractive to communities as these species are usually seasonal and inaccessible in some cases unlike the majority of conventional vegetable species that are easy to cultivate and manage in home gardens. Previous research on wild vegetables in the Eastern Cape Province by Bhat and Rubuluzu (2002) and Bvenura and Afolayan (2014) also found a decline in wild vegetable consumption. Uprety et al. (2012) argued that documentation and conservation of wild edible plants are important as this would ensure that the highest priority genetic diversity is preserved and made available for use in crop improvement programs as a contribution to future worldwide food security. Moreover, documenting such information on utilization of plant species based on perceptions of local communities is an important step in trying to understand and initiate a management protocol that incorporates public perceptions and values associated with utilization of plant resources (Atyosi et al., 2019).

**Figure 2.** Growth forms of vegetable species recorded in the Eastern Cape Province

**Figure 3.** Categorization of vegetables recorded in the Eastern Cape Province
In conclusion, results of this study have added invaluable information on edible vegetable species in the Eastern Cape Province in South Africa. The value of different forms of vegetables as sources of food needs to be appreciated by agriculturists, government policymakers, and scientists responsible for research, extension activities, and agricultural policy. Irrespective of their social or economic status all participants in this study shared their knowledge and how different vegetable types are used. Therefore, both wild vegetable species and conventional vegetables are relevant to livelihood needs of the local people.

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