

## **The Availability and Nutritional Benefits of Wild Vegetables and Fruits in Goa During the Rainy Season: A Study of Foraging Practices and Health Implications**

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In the lush coastal region of Goa, India, the rainy season brings forth a bounty of wild vegetables and fruits that have long been integral to the local diet and culture. This research paper delves into the availability and nutritional benefits of these wild edibles, shedding light on the foraging practices employed by Goa's residents and the health implications of consuming these natural treasures. Exploring the common wild vegetables and fruits found during the rainy season, the study investigates how environmental factors influence their abundance and distribution across different regions of Goa. Traditional foraging methods deeply rooted in local customs are examined alongside the impact of modernization on these practices while also considering any existing regulations governing the harvesting of wild produce. Delving into the nutritional profiles of these wild edibles, the paper compares their benefits to cultivated produce, seeking to uncover any potential health implications associated with their consumption. Furthermore, the research aims to elucidate how consuming wild vegetables and fruits contributes to the overall health and well-being of individuals in Goa, considering any cultural or social aspects intertwined with foraging and dietary habits. By addressing the potential risks and challenges of relying on wild edibles as a food source during the rainy season, this study seeks to provide a comprehensive understanding of the significance of wild vegetables and fruits in Goa's culinary landscape and their impact on human health and well-being.

### **Availability of Wild Vegetables and Fruits in Goa During the Rainy Season**

### **What are the common wild vegetables and fruits in Goa during the rainy season?**

During the rainy season in Goa, many common wild vegetables and fruits can be found, offering a rich source of antioxidants, zinc, and fibre to those who partake in them. These nutritious offerings are easily accessible in various locations such as backyards, forests, roadsides, and even local markets, where they are sold predominantly by neighbourhood vendors [1]. Among the many leafy greens available during this season, tambdi bhaji, palak, methi, chaulai, taro or arbi leaves, taikilo, Malabar spinach, and Ceylon spinach are prevalent options in the region, providing essential nutrients and culinary versatility [1][2]. The village of Canacona in South Goa is a prime spot to discover these wild vegetables, with specialities like golchi bhaji, katle bhaji, and akur, a mangrove fern typically found in marshy and mangrove areas during the monsoons, adding to the diverse array of edible greens [1]. Additionally, the tubers and leaves of various plants such as Kasal leaves, Tirpatche alu, air potato leaves, and tero are commonly consumed during this time, with delicacies like aluchi vadi crafted from alu leaves being a local favourite in Goa [1]. Furthermore, the monsoon season in Goa provides an opportunity to savour these wild vegetables. It aligns with significant cultural events like Ganesh Chaturthi, where these natural offerings can be incorporated into celebratory dishes [1].

### **How do environmental factors influence the availability of wild vegetables and fruits?**

Environmental factors significantly impact the availability and edibility of wild vegetables and fruits, shaping the local ecosystem and influencing human consumption patterns. For instance, the proper timing for harvesting specific wild plants, such as luti leaves, is crucial due to environmental influences like rainfall and temperature variations [1]. Moreover, the edibility of certain wild plants, such as luti and tero, is directly affected by environmental factors, highlighting the intricate relationship between plant growth and environmental conditions [1]. Environmental factors play a pivotal role in determining the presence of wild vegetables and fruits in a given region, affecting their growth, development, and overall availability [1]. In addition, the tender parts of certain wild plants, like tero leaves and air potato stem, being edible indicates a direct correlation between the environment and the edibility of these plants, emphasizing the impact of environmental conditions on the nutritional resources available [1]. Furthermore, environmental factors can influence the growth patterns and size of plants such as Elephant foot yams, demonstrating how external conditions shape the characteristics of wild vegetation [1]. Ultimately, environmental conditions dictate the availability of wild vegetables and fruits and

determine the edibility of specific plant parts, like Luti or Wild Elephant foot yam, underscoring the critical role of the environment in shaping the food resources accessible to local populations [1].

### **Are there specific regions in Goa where certain wild vegetables and fruits are more abundant during the rainy season?**

The rainy season in Goa brings forth a bounty of wild vegetables that thrive in the region's lush greenery. Villages in the interiors of Goa serve as a haven for various wild vegetables during this time, such as taikulo, tere, kuddu, fhakala, and khadpatli bhaji, which emerge from seasonal green patches surrounding the hamlets [3]. These wild vegetables have been a traditional part of the local cuisine, with older generations relying solely on them for sustenance during the monsoon season [3]. Besides their culinary significance, wild vegetables are also highly beneficial for health, given their natural growth and nutritional content [3]. However, the influx of urbanization and the consequent destruction of rural habitats have led to a decline in the availability of these wild vegetables in the market, signalling a concerning trend for their sustainability [3].

Interestingly, the cost of wild edible plants varies across different markets in Goa. Pernem markets offer these delicacies at a lower price than Mapusa and Panaji markets, making them more accessible to the local populace [3]. Despite the challenges posed by urbanization, wild edible plants in markets like Pernem underscores their cultural and economic importance in the region, highlighting the enduring connection between Goa's natural landscape and culinary traditions [3].

### **Foraging Practices for Wild Vegetables and Fruits in Goa**

#### **What traditional foraging methods are locals using to harvest wild vegetables and fruits?**

Several vital methods stand out in the traditional foraging practices of locals to harvest wild vegetables and fruits. For instance, when gathering these natural bounties, individuals are careful not to uproot the entire plant to avoid disturbing the delicate balance of the ecology and micro-climate in which these plants thrive [4]. Moreover, they utilize long sticks to shake down fruits from thorny branches, while some trees offer the convenience of hand-plucking berries without much effort [5]. To ensure safety and efficacy in foraging, a deep understanding of plant identification is paramount, as locals rely on their knowledge to discern between edible delights and potentially harmful plants [6]. Additionally, the

practice extends beyond mere sustenance, with locals viewing foraging as a means to assist in ecosystem regeneration and thriving by gathering what grows naturally [4]. Elders within the community serve as valuable resources of information on wild plants utilized for both food and medicinal purposes, passing down their wisdom to younger generations, who also contribute insights about their immediate environment and the resources it provides [4]. Finally, after a successful foraging expedition, locals return home with their harvest, enjoying the fruits of their labour and relishing the flavours of the wilderness they have gathered [5].

### **How has modernization impacted traditional foraging practices in Goa?**

The impact of modernization on traditional foraging practices in Goa has been profound and transformative. Once prevalent, traditional foraging practices have dwindled over time due to modernization, marking a significant departure from when the local population in Goa maintained a close connection with nature [7][8]. The shift brought about by modernization has steered attention away from traditional foraging sites such as fields, plantations, and natural habitats rich in plant diversity, ultimately diminishing the availability of wild, foraged plants like crepe ginger due to habitat destruction and construction activities in the region [8][7]. By the early 2000s, modernization in industries like mining, tourism, and real estate had already begun to take root, further encroaching on traditional foraging grounds and reducing the accessibility of wild plants that were once commonly consumed before flowering [8][7]. This transition from traditional foraging practices underscores the far-reaching consequences of modernization on Goa's cultural and ecological landscape, highlighting a stark contrast between past practices deeply rooted in nature and the evolving dynamics of a modernized society.

### **Are there any regulations or guidelines regarding the foraging of wild vegetables and fruits in the region?**

Foraging wild vegetables and fruits has a long-standing tradition, with individuals like the Goans recognizing the importance of these natural resources for nourishment, medicinal purposes, and overall health maintenance [7]. Understanding the timing and method of harvesting is crucial for foraging wild varieties, as seasons can significantly impact the edibility and quality of these plants [9]. The historical practice of gathering wild plants and herbs for sustenance has deep roots in Indian cuisine, highlighting

the cultural significance of foraging in the region's food heritage [10]. Organizations like the Botanical Society of Goa promote the appreciation of the region's rich edible fruits and food culture through events like the annual Konkan Fruit Fest, which celebrates the diverse edible offerings found in the area [8]. As foragers explore the landscapes for wild edibles, they may encounter a variety of plants like the Goa bean, which grows in tropical regions across Asia and Africa, offering a glimpse into the global diversity of foraged foods [11]. The joy derived from the direct picking of fruits from trees, as reminisced by individuals like Amonkar, speaks to the intimate connection between foragers and the natural environment. However, modern practices have shifted away from traditional foraging experiences, marked by the joy of harvesting directly from nature [5].

## **Nutritional Benefits of Consuming Wild Vegetables and Fruits**

### **What are the nutritional profiles of the commonly found wild vegetables and fruits in Goa?**

The nutritional profiles of commonly found wild vegetables in Goa present a promising picture for meeting dietary needs. These vegetables boast a comprehensive nutrient composition, low crude fat content and high moisture levels, ash, crude protein, crude fibre, carbohydrates, and energy, aligning well with recommended dietary allowances [12]. Furthermore, they are packed with significant minerals like sodium, potassium, calcium, and magnesium and essential trace elements such as iron, copper, and zinc, contributing to a well-rounded nutritional intake [12]. However, it is crucial to note that some wild vegetables contain elevated levels of heavy metals like lead, chromium, and nickel, surpassing recommended limits, except for Patshak, which falls within safe thresholds [12]. Fortunately, cadmium and mercury were absent in all the wild vegetables studied in Goa, offering a silver lining for heavy metal contamination [12]. Despite the concerns about heavy metal content, the overall nutritional potential of these wild vegetables remains high, making them a valuable resource for fulfilling dietary requirements [12]. Nevertheless, raising public health awareness regarding the excessive presence of lead, chromium, and nickel in these wild vegetables is imperative, emphasizing caution in their consumption to mitigate potential health risks [12].

### **How do the nutritional benefits of wild vegetables and fruits compare to cultivated produce?**

The comparison between the nutritional benefits of wild vegetables and fruits and cultivated produce is a topic of increasing interest and significance in dietary health. Wild fruits often outshine their commercial counterparts in several key areas. For instance, wild fruits generally contain less sugar and more fibre than cultivated fruits, making them a healthier option for individuals seeking to manage their sugar intake while increasing their fibre consumption [13]. Additionally, wild vegetables have been found to have higher iron levels compared to commercial fruits, although caution should be exercised for iron-sensitive individuals to avoid iron-related health issues [13]. Moreover, the study emphasizes the importance of including uncultivated foods to promote food security, highlighting the often-overlooked nutritional benefits of wild edibles [14]. While commercially available foods are well-documented in terms of dietary value, wild plants can provide comparable nutrition, if not more, than their cultivated counterparts, showcasing the potential of forageable foods to offer superior antioxidant and other nutritional properties [14]. This underscores the significance of exploring and incorporating wild vegetables and fruits into one's diet to reap their critical nutritional benefits and potentially enhance overall health and well-being.

### **Are there any health implications associated with consuming wild vegetables and fruits during the rainy season?**

Consuming wild vegetables and fruits during the rainy season can have significant health implications, particularly in meeting the body's vitamin C requirements. Vitamin C is a crucial nutrient for overall health and immunity, and wild vegetables and fruits such as blackcurrants, lambsquarters, persimmon, quince, and ramps are rich sources of this essential vitamin [14]. While the timing of harvesting these wild plants is crucial due to environmental factors, they can serve as natural and beneficial sources of vitamin C during the rainy season. In addition to wild varieties, commercially available foods like tomato products, potatoes, and citrus fruits can also provide ample amounts of vitamin C, aiding in meeting the recommended daily intake of this vital nutrient during the rainy season [14]. By incorporating a variety of wild vegetables and fruits into one's diet during the rainy season, individuals can boost their immune system and overall health by ensuring adequate vitamin C intake.

### **Impact of Foraging Practices on Health and Well-being**

## **How does consuming wild vegetables and fruits contribute to the overall health and well-being of individuals in Goa?**

Consuming wild vegetables and fruits in Goa provides nutritional benefits and contributes to various aspects of individuals' overall health and well-being. Foraged foods offer diverse nutrients and flavours, enhancing the local food system's sustainability and promoting food diversity [15]. Furthermore, foraging for wild food has been associated with mindfulness, meditation, and presence, improving mental well-being and a greater sense of self-worth [16][17]. Studies have shown that engaging in food foraging practices can enhance social well-being and contribute to the development of society as a whole [18]. As urban foraging gains popularity, it is increasingly recognized as a sustainable and healthy way to supplement other food sources, offering social, ecological, and economic benefits to individuals and communities [19][20]. Additionally, foraging is a means of obtaining food and a fun way to practice mindfulness and foster a deeper connection with the environment [21].

## **Are there any cultural or social aspects related to the foraging and consumption of wild vegetables and fruits?**

Foraging and consuming wild vegetables and fruits is deeply intertwined with cultural and social aspects cherished for generations. For many individuals, plucking and relishing wild strawberries in the forest can be a transformative experience, connecting them to nature profoundly [19]. Moreover, foraging wild edibles fosters community, as individuals often come together to search for and enjoy these natural treasures [19]. The tradition of foraging offers a unique opportunity to prepare and savour dishes that embody cultural heritage, such as wild garlic pesto and fresh elderflower tea, adding a layer of tradition and history to culinary experiences [19]. This cultural connection to foraging is not limited to specific regions; it extends globally, with the popularity of foraging evidenced by the widespread interest in books like Richard Maybey's "Food for Free," which promotes the gathering of wild berries and medicinal plants as a valuable culinary and cultural pursuit [19]. In many indigenous communities, foraging holds a sacred place alongside other food production practices, emphasizing the significance of sustainable relationships with the environment and traditional food systems [19]. Through supporting local foragers and learning from their practices, individuals can reconnect with nature, contribute to ecological health, and foster stronger community bonds, highlighting the multifaceted social and cultural importance of foraging [19].

## **What are the potential risks or challenges associated with relying on wild vegetables and fruits as a food source during the rainy season?**

Relying on wild vegetables and fruits during the rainy season may pose significant risks, particularly in the case of mushroom consumption. Mushroom foraging can be perilous as many edible species have toxic doppelgangers, making accurate identification challenging [19]. This risk is further amplified during the rainy season when mushrooms proliferate in damp environments. Consuming misidentified mushrooms can lead to severe poisoning and even fatalities, emphasizing the importance of expert knowledge or caution when foraging for wild edibles. Environmental conditions during the rainy season can also impact the edibility and safety of various wild plants, highlighting the need for careful assessment and consideration before relying solely on foraged foods for sustenance.

The availability and nutritional benefits of wild vegetables and fruits in Goa during the rainy season, as explored in this research paper, shed light on the intricate relationship between environmental factors, foraging practices, and health implications. The study underscores how environmental conditions significantly influence the presence and edibility of wild vegetation, shaping both the local ecosystem and human consumption patterns. The research highlights the abundance of common wild vegetables and fruits in the region during the monsoon, such as tambdi bhaji, palak, methi, and taro leaves, and these natural offerings provide rich sources of antioxidants, zinc, and fibre. Moreover, the cultural significance of incorporating these wild edibles, like aluchi vadi and celebratory dishes during Ganesh Chaturthi, showcases the deep-rooted connection between traditional practices and culinary heritage in Goa. The discussion further delves into the importance of sustainable foraging practices, emphasizing the need for careful assessment and consideration before relying solely on wild foods for sustenance, especially during the rainy season when risks of mushroom poisoning may arise.

Additionally, the impact of modernization on traditional foraging practices and the decline in the availability of wild vegetables due to urbanization underscore the threats to the sustainability of these valuable resources. Future research directions could focus on exploring innovative ways to preserve and promote the consumption of wild vegetables and fruits, addressing the challenges posed by environmental changes and urban development. Overall, this research paper contributes to the ongoing dialogue surrounding the cultural, nutritional, and environmental significance of wild edibles in Goa, advocating for preserving traditional knowledge and promoting sustainable food systems for the well-being of local communities and ecosystems.



**Conclusion:**

The study has highlighted the significant availability and nutritional benefits of wild vegetables and fruits in Goa during the rainy season. The foraging practices are deeply rooted in the local culture and have provided valuable insights into the traditional knowledge of these wild foods. Furthermore, the health implications of consuming these wild vegetables and fruits have been demonstrated to be substantial, providing a rich source of essential nutrients and contributing to the community's overall well-being. This study highlights the importance of recognizing and preserving the foraging practices and the nutritional value of wild foods in ensuring food security and promoting a diverse and healthy diet.

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