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Diversity and Ethnobotanical Significance of Wild *Solanum* Species in Odisha, India

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ABSTRACT

Across the globe, individuals continue to rely on plants to meet fundamental human requirements, including sustenance, attire, housing, and healthcare. Among the diverse plant families, Solanaceae houses thousands of species worldwide, with many of them being wild and plays a pivotal role in preserving biodiversity and holds substantial ethnobotanical significance. Within this family, the *Solanum* genus holds particular significance in traditional medicine and human nutrition, boasting three major food crops: *S. melongena* (eggplant), *S. lycopersicum* (tomato), and *S. tuberosum* (potato), staples in daily diets worldwide. This study delves into the diversity of the *Solanum* genus in Bhadrak district, Odisha, India, with a primary focus on assessing its distribution and ethnobotanical importance. A field survey involving 97 respondents (76 male; 21 female) was conducted, involving interviews with local communities, traditional healers, and agricultural practitioners. The study documents six *Solanum* species with both food and medicinal applications. These species have been used to address a wide array of health issues, including asthma, coughs, bronchitis, liver problems, oral ulcers, rheumatism, skin diseases, tuberculosis, and toothaches. Various plant parts, such as leaves, roots, fruits, and seeds, are commonly employed in these remedies. Moreover, the *Solanum* species' remarkable adaptability to diverse environments highlights their resilience and ecological significance. The present findings serve as a platform for future research on *Solanum*'s contributions to traditional medicine and ecological systems. Interdisciplinary collaboration among researchers, indigenous communities, and policymakers, are essential for sustainable utilization of *Solanum* genus, paving the way for a more healthful and harmonious coexistence with our natural world.

Keywords: Biological diversity; fruit crop; Solanaceae; taxonomic description; traditional medicine

INTRODUCTION

Biological diversity is constantly in flux, adapting to the ever-changing environment (Assogba et al., 2022). Emerging research underscores the profound influence of climate-related variables like precipitation and temperature on the distribution of biodiversity and the formation of suitable habitats for various species (IPCC, 2021). Of the myriad life forms that grace our planet, approximately 370,000 species of flowering plants have been cataloged (RBG Kew, 2016). Among these, the Solanaceae family, known as nightshades, is pivotal in the plant kingdom. This botanical family wields considerable influence over the global economy, human nutrition, and plays an indispensable role in traditional medicinal practices (Hawkes, 1999; Afroz et al., 2020). The epicenter of primary diversity for the Solanaceae family is widely believed to be in South America, where it is thought to have originated (Hunziker, 1979). This region is distinguished by a remarkable proliferation of Solanaceae species, boasting the highest number of endemic genera (Dupin et al., 2017). Over time, this family has dispersed from its neotropical origins to establish a global presence, spanning every vegetated continent. This botanical family encompasses an impressive array of plant species, estimated to range from 2400 to 2700, and is organized into approximately 96 to 98 genera (Olmstead et al., 2007; Barboza et al., 2016). The diversity within this family encompasses a wide spectrum of life forms, from woody trees to herbaceous annuals, with representatives including vines, shrubs, and plants found on every continent except Antarctica (Sarker & Rahman, 2016; Nath et al., 2017). Solanaceae exhibits adaptability across an extensive range of terrestrial environments, thriving in arid desert landscapes as well as lush rainforests (Knapp et al., 2004). Despite being categorized as a "medium-sized family," Solanaceae distinguishes itself among flowering plants due to its extensive history of human

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domestication (Daunay et al., 2007). This family plays a prominent role in the cultivation of economically significant cash crops, prominently featuring eggplant (*Solanum melongena* L.), ranking as the second most prominent fruit crop within the family after tomatoes (*S. lycopersicum* L.). It also encompasses widely recognized crops like potatoes (*S. tuberosum* L.) and chili peppers (*Capsicum* spp.) (Ghatak et al., 2017; Omar et al., 2021; Gautam & Adhikari, 2021). Moreover, the Solanaceae family boasts a diverse range of lesser-known cultivated species, including approximately 17 underutilized varieties within the *Solanum* L. genus alone, some of which are semi-cultivated or harvested from the wild (GFU, 2010). Additionally, this family contributes to ornamental horticulture with the inclusion of beloved flowers like Petunia (*Petunia x hybrida* (Hook.) Vilm.) and trumpet flower (*Brugmansia* spp.) (Barboza et al., 2016). Simultaneously, the family is home to numerous well-known medicinal plants renowned for their diverse applications in traditional medicinal systems such as Ayurveda, Traditional Chinese Medicine, Siddha, Unani, and Homeopathy and has played a pivotal role in the early stages of medicinal plant-based drug discovery. (Nino et al., 2006; Shah et al., 2013; Chowanski et al., 2016; Tamokou et al., 2017; Biswas et al., 2023). Noteworthy species such as *Atropa, Hyoscyamus, Withania, Capsicum,* and *Nicotiana* continue to be valued in herbal practices (Chowanski et al., 2016). However, it is essential to acknowledge that the carcinogenic *Nicotiana tabacum* (and related species) (Lee, 2006) has arguably caused the most significant number of human fatalities due to the global legalization and consumption of tobacco as a legal drug (Drope et al., 2022).

The type genus of the Solanaceae family, *Solanum* L., is its largest and most intricate housing approximately 1,400 species, securing its position as one of the top ten genera in terms of species diversity (Frodin, 2004). In India, the genus *Solanum* L. stands out as the most speciose, featuring 42 species distributed across various habitats of the country (Bolleddu et al., 2018). These species hold significant economic value and are revered for their prevalent ethnomedicinal properties (Muthoni et al., 2012; Jabamalairaj et al., 2019; Pendil, 2019; Tyagi et al., 2020). The current state of knowledge regarding the flora of Odisha state in India remains fragmented. The "Flora of Odisha" (Saxena & Brahmam, 1996) provides a comprehensive catalog of 2,727 plant species, including 2,576 angiosperms across 159 families. Within this extensive compilation, detailed accounts of 12 *Solanum* species are provided, consisting of nine wild and three cultivated species. Odisha, a state on the east coast of India, comprises 30 districts. Recent research has examined *Solanum* species in various districts of Odisha, including Balasore, Khurda, Rayagada, Nayagarh, Kalahandi, Sambalpur, and Bolangir (Sahu et al., 2017, Kalidass & Panda, 2019). However, a review of the literature reveals a lack of baseline information on the distribution of *Solanum* species within the Bhadrak district, Odisha. Hence, this study aims to explore the diversity of *Solanum* species in the region and their various uses. The primary objective of this investigation is to systematically explore the distribution and ethnobotanical dimensions of *Solanum* species within the Bhadrak district, Odisha, India. This study seeks to elucidate the significance of *Solanum* species within local communities, providing invaluable insights that are crucial for conservation efforts, utilization, and guiding future research endeavors.

MATERIALS AND METHODS

Study area

The state of Odisha is located in eastern India and bounded by longitudes 81° 43' to 87 ° 29' east and latitudes 17° 49' to 22 ° 34' north. Odisha occupies a strategic position at the head of the Bay of Bengal and boasts a captivating coastline that stretches approximately 480 km. Covering a vast expanse of 155,707 sq. km, it constitutes about 4.87% of the total landmass of India. Odisha's diverse topography is segmented into five major regions, each distinguished by unique physico-geographical characteristics. These regions encompass the coastal plain in the east, the middle mountainous and highlands region, the central plateaus, the western rolling uplands, and the major flood plains. These geographical variances create a wide array of habitats that nurture a rich and diverse flora and fauna. Adding to the state's geographical complexity, Odisha is traversed by several perennial rivers, including the Mahanadi, Brahmani, Baitarani, Rushikulya, Birupa, Budhabalanga, and Subarnarekha, accompanied by their numerous tributaries. However, this abundance of water bodies also renders the state susceptible to flooding. Furthermore, the Eastern Ghat range of hills runs through the heart of Odisha, commencing from the north of Similipal and extending through 17 districts of the state. The state's vegetation is primarily characterized by tropical moist deciduous forests (Champion & Seth, 1968). In terms of climate, Odisha experiences a hot and humid climate throughout the year, with relatively short winters.

Bhadrak district is situated in the northeastern part of Odisha, spanning latitudes

from 20° 43' to 21° 13' N and longitudes from 86° 6' to 87° E. Covering an area of 2,505 square kilometers, the district was home to a population of 1.507 million according to the 2011 Census. Bhadrak district shares its borders with Balasore district to the north, Jajpur district to the south, the Bay of Bengal and Kendrapara district to the east, and Koenjhar district to the west (Figure 1). Despite constituting only 1.61% of the state's landmass, it accommodates 3.62% of the state's total population. The majority of Bhadrak district's residents reside in rural areas, and agriculture serves as the primary livelihood for its inhabitants. Due to its proximity to the Bay of Bengal, the region is susceptible to specific natural calamities. Occasional seismic tremors are observed in the area, likely due to its geological alignment. During the monsoon season, frequent thunderstorms with substantial rainfall can occur, sometimes leading to weather-related hazards. Additionally, in April and May, dust storms can impact local weather conditions.

Data collection

The data collection process for this study spanned Bhadrak district and occurred between July 2014 and July 2020, encompassing both rural and urban areas and accounting for all seasons. Before initiating the fieldwork, the research objectives, methodologies, and potential benefits were communicated to the participants in the local language, Odia. Consent and cooperation were actively sought from the participants before proceeding with the documentation of the plant species they utilized. The survey encompassed all seven blocks within the district: Basudevpur, Bhadrak, Bhandaripokhari, Bonth, Chandbali, Dhamnagar, and Tihidi. Throughout the survey, plant samples were collected, and photographs of plant species were taken. The study gathered information from 97 informants (76 male, 21 female) recognized in their communities for exceptional knowledge of *Solanum* species, particularly focusing on local farmers, elderly individuals, and local healers. These informants, spanning ages 21 to 80, represented diverse professions, educational backgrounds, and socioeconomic statuses. The distribution of interviewees included 10% aged 21-40, 50% aged 41-60, and 40% aged 61 or older. The demographic characteristics were delineated in Table I. To ensure the relevance of collected information to the study objectives, specific criteria were employed for both inclusion and exclusion of participants. Inclusion criteria involved selecting individuals with direct or indirect experience with *Solanum* species, including those using the plants for medicinal purposes or possessing traditional knowledge about them. Exclusion criteria were applied to individuals below a certain age (e.g., under 18 years), those with health conditions affecting reliable information provision on ethnomedicinal practices of *Solanum* species, those facing language barriers hindering accurate data collection, individuals not providing informed consent, and participants with limited knowledge or experience with *Solanum* species. Data collection was executed through interviews following established protocols (Martin, 1995; Huntington, 2000). The survey methodology employed a semi-structured questionnaire approach, complemented by open-ended interviews, informal discussions, and direct observations (Khoja et al., 2022a; Khoja et al., 2022b). Interviews were conducted both individually and in group settings, all conducted in the local language, thus providing specific insights into the plants. These insights were subsequently cross-verified for accuracy. Taxonomic details, including vernacular names, botanical names, and information regarding flowering and fruiting seasons, were recorded from the respondents. Moreover, comprehensive data was collected regarding the specific plant parts utilized, their availability, methods of consumption, and potential medicinal applications. Given that plant species were primarily identified by their local names, the relevant Odisha flora (Saxena & Brahmam, 1996) was referenced to aid in their accurate identification. The list of compiled plant species was systematically organized according to the APG IV (2016) classification system. To ensure precision in nomenclature, the current scientific names of each species were verified using the Plants of the World Online database. Subsequently, the collected data were presented using tables and figures.

RESULT AND DISCUSSION

The well-being of humanity is intrinsically tied to the health of Earth's natural systems, which play a pivotal role in regulating the environment and sustaining a habitable planet. Within any specific region, the diversity of life, often referred to as biodiversity, gives rise to intricate ecosystems. These ecosystems are composed of a myriad of individual organisms representing numerous species, and together, they play a critical role in fostering and upholding essential global processes (Folke et al., 2021). In recent times, there has been a growing interest in the potential applications of plant-derived substances, with a particular focus on medicinal plants. This group of species has garnered attention due to their

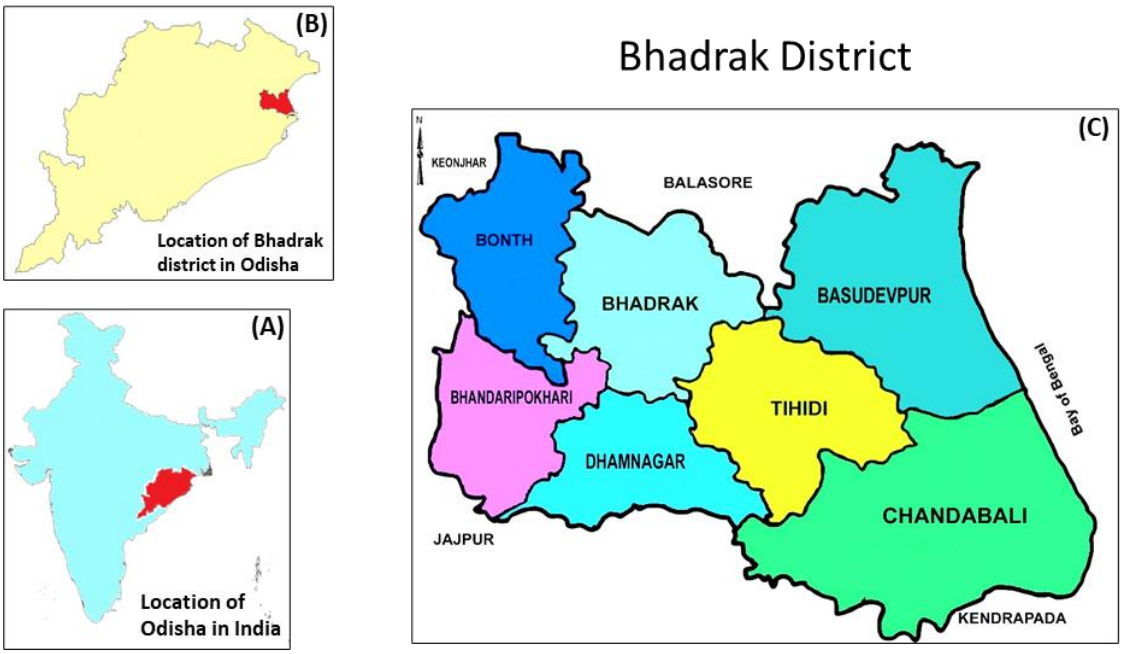

Figure 1. A. Location of Odisha state in India, B. location of Bhadrak district in Odisha and C. map of Bhadrak district showing study sites

Table I. Demographic characteristics (n=97)

	Number	In percent (%)
Age		
21–40	10	10.3
41–60	48	49.5
61–70	28	28.9
71 above	11	11.3
Sex		
Male	76	78.4
Female	21	21.6
Educational level		
Primary	18	18.5
Middle	23	23.7
High School	31	32.0
Higher Secondary	16	16.5
University	09	9.3
Occupation		00
Self Employed (local farmers, healers)	53	54.7
Govt. Employed (teacher, bank officer)	27	27.8
Unemployed (students, housewives)	17	17.5

accumulation of diverse active compounds, holding promise for the treatment of a wide array of diseases in both humans and animals. Furthermore, medicinal plants serve as a valuable source of bioactive compounds, finding utility in traditional medicine, contemporary pharmaceuticals, nutraceuticals, dietary supplements, folk remedies, pharmaceutical intermediates, and the development of new drugs (Ncube et al., 2008). Beyond their medicinal significance, the diverse flora in an ecosystem plays a pivotal role in shaping various ecosystem functions. This includes improving soil quality, aiding in water retention, enhancing resilience against extreme weather conditions, creating habitats for wildlife, sequestering carbon, contributing to climate mitigation efforts, and enhancing urban landscaping (Pearse & Hipp, 2009; Seddon et al., 2020). Our current research represents a comprehensive survey of *Solanum* species across different habitats within the Bhadrak district. The study area involves the

collection of information from 97 respondents with diverse backgrounds, including variations in age, profession, and educational history. All respondents were selected in consultation with village heads, ensuring representation from both males and females. The informants were literate, possessing at least a primary school level education. The informants comprise teachers, farmers, healers, unemployed students, and housewives. Amongst them, the elderly in their sixties and above occupied 40%, while people between 21 and 40 years old occupied 10.3%. Out of the total informants, 27.8% were engaged in government jobs like teachers, and officers, while 54.7% were self-employed like farmers, and healers and the rest 17.5% of the informants were unemployed including students and housewives (Table I). The key interview questions and the corresponding responses were obtained to explore the diverse ethnobotanical uses of *Solanum* species (Table II). Our study has identified six *Solanum* species in this region (Table II; Figure 2). This is fewer than the ten species reported in North and North-eastern Haryana (Singh et al., 2014), and the eight species documented in eastern Uttar Pradesh (Singh et al., 2019). However, our findings are consistent with those of a recent study in the Rajouri District of Jammu and Kashmir UT (Zanit et al., 2022).

Solanum nigrum L., originally native to Eurasia, has been introduced to various regions, including the Americas, Australasia, and South Africa (Jabamalairaj et al., 2019). This plant is commonly found growing along roadsides, in wooded areas, and in disturbed habitats. Extensive research has unveiled a plethora of valuable compounds present in *S. nigrum*, including anthocyanidins, glycoproteins, glycoalkaloids, and polyphenolics (Lee et al., 2004; Ravi et al., 2008). Additionally, *S. nigrum* is rich in amino acids such as arginine, aspartic acid, alanine, isoleucine, L-proline, serine, and valine (Ganguly et al., 2009). This versatile plant has a history of culinary and traditional medicinal use in numerous countries, with both its ripe fruits and leaves finding applications in these domains (Jabamalairaj et al., 2019). In the surveyed area, some people eat the fruit as a vegetable, following the findings of Samal et al. (2019), Sanu et al. (2023), and Wang et al. (2017). Furthermore, *S. nigrum* has been employed to treat a wide range of health issues, including liver disorders, chronic skin conditions like psoriasis and ringworm, inflammatory ailments, menstrual pain, fevers, diarrhea, eye diseases, and even hydrophobia (Kritikar & Basu, 1935 Chidambaram et al., 2022). In the current study, local communities have been utilizing *S. nigrum* leaves for the treatment of oral ulcers, aligning with the studies of Rajith & Ramachandran (2010) and Patel et al. (2014). Patel and colleagues (2014) conducted an experiment using an extract from *S. nigrum* leaves. They administered this extract at doses of 100 and 200 mg/kg to rats with chemotherapy and chemoradiotherapy-induced oral mucositis. The results showed that higher doses were more effective in protecting against mucositis. The treatment groups had less severe mucositis and improved food intake. Similarly, *Solanum torvum* Swartz, commonly known as Turkey berry, originally hails from Central and South America and is now widely distributed in the tropical regions of the world and also cultivated in Africa, Asia, and the West Indies (Jaiswal, 2012; Vandebroek & Picking, 2020). This versatile species thrives in a range of habitats, from moist and fertile soil to drought-prone and wet environments, making it adaptable to diverse ecosystems such as thickets, dry plains, woodlands, rocky hillsides, pastures, swamps, roadsides, and waste places. In the studied region, it was observed that some people consume the fruit as vegetable. The fruits of *S. torvum* are highly valued as a vegetable and constitute a dietary staple for many Indians including the people of Odisha (Jena et al., 2018, Samal et al., 2019; Ray et al., 2020). Phytochemical analyses have revealed that *S. torvum* fruits are rich in alkaloids, flavonoids, saponins, tannins, glycosides, vitamins, and essential organic nutrients (Fui, 2012). Across Africa and Asia, its fruits, seeds, and vegetative parts are frequently employed in traditional medicine to prevent and treat various conditions, including fever, cough, wounds, pain, liver ailments, tooth decay, skin infections, and athlete's foot, reproductive issues, arterial hypertension, and even poisoning, where it serves as an antidote (Kala, 2005; Kamble et al., 2009; Balachandran et al., 2012). *S. torvum* is renowned for its diverse medicinal properties, including sedative, diuretic, hemostatic, haemopoietic, and antimicrobial effects (Fui, 2012; Kamble et al., 2009; Biney et al., 2019). Additionally, it exhibits antioxidant properties, effectively scavenging free radicals (Sivapriya & Srinivas, 2007; Helilusiatiningsi, 2021). In the present study, local communities utilize *S. torvum* fruits to address issues like liver and spleen enlargement and cough, while the root is employed as a poultice for healing foot cracks. These findings align with previous studies of Siemonsma and Piluek (1994), Rajith & Ramachandran (2010), Eko et al. (2020), Pauline Jenifer & Beulah Jerlin (2022), and Putri & Sukardi (2023).

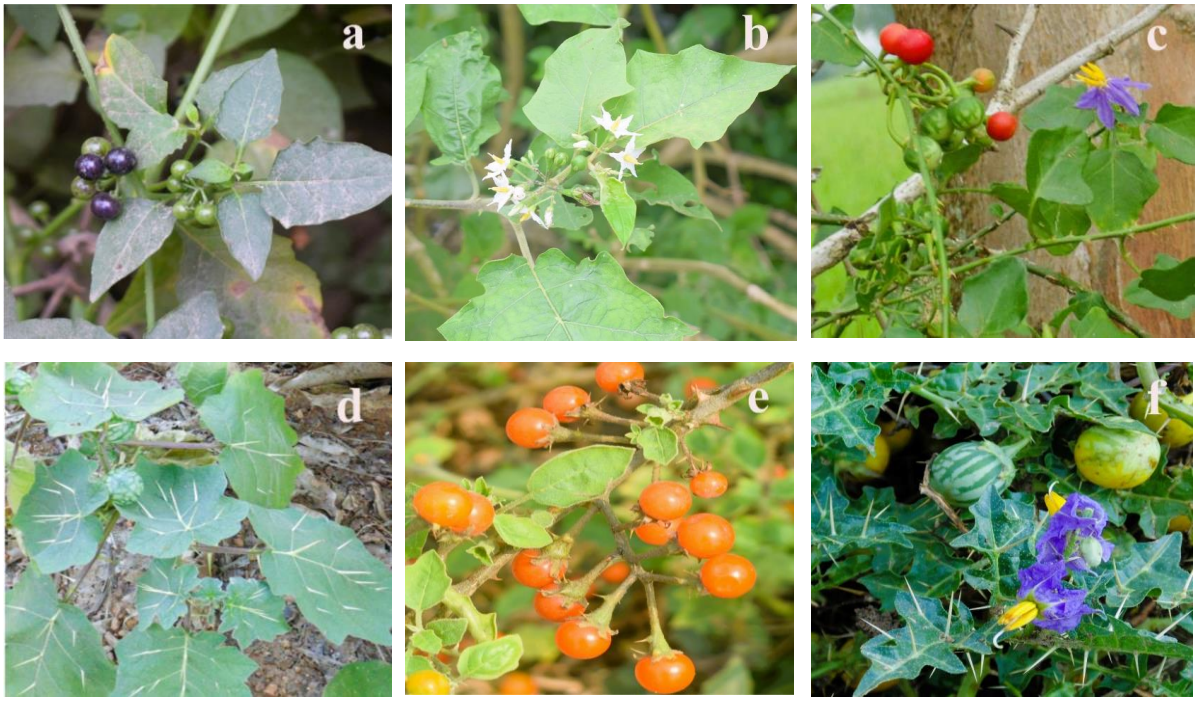

Figure 2. a. *Solanum nigrum* L., b. *Solanum torvum* Sw., c. *Solanum trilobatum* L., d. *Solanum viarum* Dunal, e. *Solanum violaceum* Ortega and f. *Solanum virginianum* L.

Solanum trilobatum L., commonly known as nightshade, is a prickly and sprawling perennial climber with vibrant green foliage. It thrives in arid environments, often found along roadsides and in wastelands. This plant is characterized by its spiny branches, deltoid or triangular leaves with irregular lobes, striking purplish-blue flowers arranged in clusters called cymes, and small, round berries that vary in color from red to scarlet. This species is native to various Asian countries, including India, Sri Lanka, Indonesia, Singapore, and Malaysia (Nadkarni, 1976). In the traditional medicinal systems of Ayurveda and Siddha, roots, fruits, and leaves are highly regarded for their effectiveness in treating a range of respiratory tract issues like acute and chronic bronchitis, asthma, sinusitis, tonsillitis, the common cold, cough, and pulmonary infections (Mohan et al.,1998; Govindan et al., 1999; Govindan et al., 2004). In the present study, local communities have been known to prepare decoctions from the berries and flowers of this plant to address coughs and chronic bronchitis. These findings substantiate earlier reports (Mohan et al., 1998; Govindan et al., 1999; Govindan et al., 2004; Navreen et al., 2022) highlighting its use for the treatment of various respiratory ailments, including bronchial asthma, sinusitis infections, and chest congestion. Likewise, *Solanum viarum* Dunal, a prickly perennial plant popularly known as tropical soda apple, has expanded beyond its native range in Argentina and central Brazil to become an invasive weed in regions including Africa, India, and Nepal, thriving in diverse habitats such as roadside ditches, pastures, low-elevation forest edges, and disturbed areas (Bowler, 2014). In the region under study, some people consume the fruit as a vegetable, which aligns with the studies of Samal et al. (2019). In our study, we found that the fruit was effective in treating rheumatism, chronic asthma, and skin diseases. Our findings are corroborated by the studies conducted by Laldinfeli et al. (2019), Pandey et al. (2020), and Bushi et al. (2021).

Solanum violaceum Ortega, commonly referred to as "violet nightshade," is a spiny, highly branched shrub covered with densely packed, minute star-shaped hairs on its younger branches. This plant exhibits a wide distribution, spanning regions across China, India, Jawa, Laos, Bangladesh, the East Himalaya, Hainan, Myanmar, Nepal, Pakistan, Yemen, Vietnam, the Philippines, Assam, Saudi Arabia, Sri Lanka, Taiwan, and Thailand (Kaunda & Zhang, 2020). It thrives in diverse habitats such as wastelands, roadsides, and open scrublands. The berries of *S. violaceum* are a nutritional treasure, containing crude protein, carbohydrates, total ash, alkaloids, polyphenols, and saponins (Aberoumand, 2012). In India, particularly in Assam, Arunachal Pradesh, Mizoram, and Nagaland, these berries are consumed as a vegetable. They are notably rich in crude fibers, calcium, and vitamin C, contributing

Table II. The key interview questions and the corresponding responses during the study

Sl. No.	Interview Question	Summary of Responses
1	Informants experience	Informants shared the duration of their experience using *Solanum* species for treating various ailments.
2	Local names of medicinal plants	Local names of medicinal plants used by informants were documented.
3	Scientific names and family	Knowledge of scientific names and plant families was probed and recorded.
4	Plant type	Informants identified the plant type (herb, shrub, climber, or tree) for each medicinal plant.
5	Flowering and fruiting phenology	Phenological information, including flowering and fruiting patterns, was collected for medicinal plants.
6	Medicinal use for specific diseases	Informants detailed the diseases for which they used specific medicinal plants.
7	Plant parts used	The specific plant parts used in medicinal preparations were documented.
8	Preparation method	Detailed descriptions of the methods used for preparing medicinal concoctions were recorded.
9	Use singly or in combination	Informants specified whether medicinal plants were used singly or in combination with other plant parts.
10	Additional ingredients	Any additional ingredients, aside from plant material, were noted.
11	Consumption state (dried or fresh)	The state in which medicinal plants were consumed (dried or fresh) was recorded.
12	Administration method	The method of administration, such as tea, infusion, or topical application, was documented.
13	Dosage information	The recommended dosage for medicinal preparations was gathered.
14	Duration of treatment	The duration of treatment recommended for specific ailments was documented.
15	Age group of patients	Informants identified the age groups (baby, child, adult) for which medicinal plants were recommended.
16	Plant source (cultivated or wild)	Whether the medicinal plants were cultivated, harvested from gardens/farms, or sourced from the wild was documented.
17	Reported side effects	Any reported side effects of the medicinal preparations were noted.
18	Duration of preparation	The duration for which the medicinal preparation should be taken was recorded.
19	Food value	Any recognized food value of the medicinal plants was documented.
20	Other uses	Additional uses of the medicinal plants, beyond medicinal purposes, were captured.

to their value as a dietary source (Agrahar-Murugkar & Subbulakshmi, 2005). Throughout history, various parts of this plant, including its fruits, leaves, and roots, have been employed in traditional medicine. They serve as remedies for diverse ailments such as loss of appetite, anorexia, asthma, colic, digestive disorders, heart diseases, hypertension, nasal ulcers, body pains, toothaches, vomiting, and worm infestations caused by roundworms, whipworms, hookworms, tapeworms, and flukes (Jain & Borthakur, 1986; Raju et al., 2013; Eko et al., 2020). In a contemporary context, a novel application of *S.violaceum* involves the use of fruit powder mixed with a glass of milk applied to the mouth for toothache relief. This practice aligns with earlier studies of Jain & Borthakur (1986), Raju et al. (2013), Kokni et al. (2016), and Iqubal et al. (2022). Similarly, *Solanum virginianum* L., commonly referred to as Yellow Berried Nightshade, is a prickly, diffuse, bright green perennial herb frequently found in waste areas, along roadsides, and in open areas across India. This plant is well-documented in various texts such as Dravyaguna

Table III. List of Solanum species along with their taxonomic parameters and medicinal uses in Bhadrak district

Scientific name	Local name	Hait	Habitat	Flowering and Fruiting	NI	NV	Uses
Solanum nigrum L.	Nununia	Herb	Waste ground, roadsides	Nearly all the year-round	41	27	Leaves are used to treat oral ulcers. Fruit is consumed as vegetable.
Solanum torvum Sw.	Kathkoli	Shrub	Waste places, roadsides	Most of the year	53	39	Fruits are useful in liver and spleen enlargement; decoction is used for cough. The root is used for poulticing cracks in feet. Fruit is consumed as vegetable.
Solanum trilobatum L.	Nab-hiankuri	Scrambling shrub	Hedges, thickets	Throughout the year	67	35	Berries and flowers decoction is used for cough and chronic bronchitis.
Solanum viarum Dunal	Bhegi-baigan	Undershrub	Waste places	Most of the year	23	11	Fruit is used for the treatment of rheumatism, chronic asthma, and skin disease. Fruit is consumed as vegetable.
Solanum violaceum Ortega	Dengabheji	Shrub	Waste places	Most of the year	37	29	Fruit powder added in a glass of milk is kept in the mouth for a while to relieve toothache.
Solanum virginianum L.	Bhegi-baigan	herb	Waste places, roadsides	Throughout the year	73	42	Fruit paste mixed with pepper and cow ghee is given for seven days to cure tuberculosis. The fruits and seeds are burnt and smoked like cigarettes. The smoke is allowed to pass through the affected teeth to get relief from toothache. Fruit is consumed as vegetable.

NI: Number of informants, who reported the use of *Solanum* species for the treatment of diseases, NV: Number of villages, where the reported *Solanum* species is used for various ailments.

Vigyan and The Ayurvedic Pharmacopoeia of India. In Hindu Materia Medica, it is primarily recognized for its expectorant and antipyretic properties, making it valuable in the treatment of conditions like asthma, chronic cough, fever, respiratory disease, and rheumatism (Roshy Joseph et al., 2012; Mandal et al., 2021). *S. virginianum* is a member of the 'Dashamoola' group in Ayurveda, and it is mentioned in the Ayurvedic Pharmacopoeia of India that formulations like 'Dasmul Asava' and 'Dashmularishta,' containing the plant's roots, are used as tonics for lactating

mothers (Tekuri et al., 2019). Ancient Ayurvedic treatises such as Charaka Samhita and Sushruta Samhita also extol the curative properties of both the fruits and the entire plant, prescribing their use in treating various ailments, including mis-peristalsis, bronchial asthma, piles, dysuria, and for rejuvenation (Saived, 1963). The preparation 'Kantkari Ghrita,' mentioned in Charaka Samhita, is a unique formulation for addressing cough, cold, fever, asthma, and other cardiac diseases (Saived, 1963). In the study area, certain individuals use the fruit as a vegetable, which corresponds to the findings of Samal et al. (2019). A paste made from the fruits, combined with pepper and cow ghee, is administered for seven days to treat tuberculosis. Additionally, the fruit and seeds are sometimes burnt and smoked, similar to a cigarette, with the smoke directed towards affected teeth to alleviate toothache. The use of this plant for tuberculosis treatment is also reported in other regions (Ponnusamy et al., 2023; Bharath et al., 2023). Furthermore, fruit and seed utilization for dental care has been documented (Shahiladevi et al., 2006; Anwikar & Bhitre, 2010; Tekuri et al., 2019).

CONCLUSION

The rise in global population, the emergence of antibiotic resistance, and the emergence of new strains of pathogenic organisms causing previously unknown diseases have heightened the significance of underutilized plants as untapped natural resources for nutrition and medicine. This makes them increasingly crucial in the fight against hunger, malnutrition, and health challenges. Our investigation into the *Solanum* genus (Solanaceae) in Odisha's Bhadrak district, India, has yielded valuable insights into both its biodiversity and ethnobotanical relevance in this pantropical genus. Documenting the presence of six species thriving in diverse local habitats has significantly advanced our understanding of Solanum's distribution and diversity in this region. *Solanum nigrum, S. torvum, S. viarum*, and *Solanum virginianum*'s versatility in both culinary and therapeutic applications, alongside *S. trilobatum*, and *S. violaceum*'s contributions to traditional medicine, exemplifies the profound connection between nature and human well-being. Furthermore, the remarkable adaptability of these *Solanum* species to varied environments highlights their resilience and ecological significance. These findings are poised to serve as a foundational platform for future research, encouraging deeper investigations into *Solanum*'s contributions to traditional medicine and ecological dynamics. Interdisciplinary collaboration among researchers, indigenous communities, and policymakers, are warranted for sustainable utilization of *Solanum* genus, paving the way for a more healthful and harmonious coexistence with our natural world.

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