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PLANT DIVERSITY AND BIO CULTURAL SIGNIFICANCE OF CULTIVARS IN THE BACKYARDS OF HALAKKI VOKKALIGA TRIBES OF UTTARA KANNADA DISTRICT, KARNATAKA, INDIA

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ABSTRACT

The study was conducted in the year 2022-23 to assess the knowledge of Halakki Vokkaliga tribes on plant diversity and their livelihood patterns in the year 2022-23 the with a sample of 120 respondents selected through purposive random sampling in Ankola and Kumta talukas of Uttara Kannada district. A questionnaire on knowledge was prepared using teacher made test and the primary data was collected through personal interview method using semi structured interview schedule. Fifty percent of the respondents in Ankola and 35.00 percent of the respondents in Kumta exhibited medium level of knowledge. The backyards of Kumta exhibited the higher plant diversity than Ankola, with diversity indices indicating values of 0.158 for Simpson's Dominance Index, 0.842 for Simpson's Diversity Index, 6.329 for Simpson's Reciprocal Index, and 2.936 for the Shannon-Wiener Diversity Index. Kanakambaram, coconut, banana and tulsi were found predominantly found in the backyards of Halakki tribes.
***Keywords*:** Halakki Vokkaliga, Knowledge, Plant diversity, Backyards.

Introduction

Tribes, often referred to as indigenous peoples, play a vital role as stewards of the world's pristine regions, which are characterized by their diverse and culturally rich heritage. Across the globe, there are over 370 million indigenous individuals residing in unexplored lands, as reported by the World Health Organization (WHO) in 2020 (Abhishek, 2020).

The Halakki Vokkaligas, a prominent forest tribe, inhabit the hill and coastal regions of the Uttara Kannada district in Karnataka. The Halakki community, with about 1.50 lakh population, is spread across in four taluks of Uttara Kannada (Gururaj, 2021). This indigenous community distinguishes itself with a unique identity, notably through their distinct dialect of the Kannada language called 'Halakki Kannada.' This linguistic feature, along with other cultural elements, contributes to their rich heritage.

The Halakki Vokkaligas have preserved a legacy of traditions, customs, and practices passed down through generations. Their cultural heritage encompasses a wide array of elements such as rituals, festivals, art, music, dance, and oral narratives. Through these cultural expressions, the Halakki Vokkaligas maintain a strong connection to their roots. Crucially, their way of life involves coexisting with nature. They cultivate indigenous crops, engage in the conservation of natural resources, and contribute to biodiversity preservation. This harmonious relationship with the environment is an integral part of their cultural identity, further reinforcing their unique and sustainable way of life.

Agriculture is the Halakki's primary occupation. According to the beliefs of local people, it was the fusion of rice and milk by lord Shiva and Parvathi during land tillage that gave birth to the community and they obtained their name "Halakki," signifying

their unique origin and connection to the agrarian way of life (Arati, 2017).

The connection between plant diversity and tribal populations is deeply rooted in the symbiotic relationship that these communities have developed with their natural surroundings (Smith & Wishnie, 2000). Traditional knowledge, practices, and cultural values of indigenous tribes are often intertwined with the plants found in their local ecosystems. These plants serve as sources of food, medicine, shelter, and spirituality for these communities. Furthermore, tribal populations have a profound understanding of sustainable resource management, handed down through generations, which contributes to the conservation of plant diversity.

Considering the aforementioned facts and details, the study was undertaken with the specific objective to know the plant diversity in the backyard of Halakki Vokkaliga tribes and to assess the knowledge of Halakki Vakkaliga tribes on plant diversity in their backyard.

Materials and Methods

Field survey

The study was conducted in the year 2022-23 in Uttara Kannada district of Karnataka. quantitative research design using the survey method was used for the study. The sample included the Halakki Vokkaliga tribes in Ankola and Kumta talukas particularly from Belambara and Bedigeri villages of Ankola taluka, Hegde and Tanniekuli villages of Kumta. The total sample size constituted of 120 respondents which comprised of 15 men and 15 women selected from four villages through purposive random sampling technique. A questionnaire on knowledge was prepared using teacher made test and was administered to the respondents to quantify their knowledge on diversity of plant population in their backyards. A pre-tested semi-structured interview schedule was employed to collect the required information through personal interview method. The collected data from the respondents was tabulated and analyzed using the statistical tools like frequency and percentages. In order to find the diversity, the diversity indices proposed by Simpson (1949) and Shannon-Weiner was used.

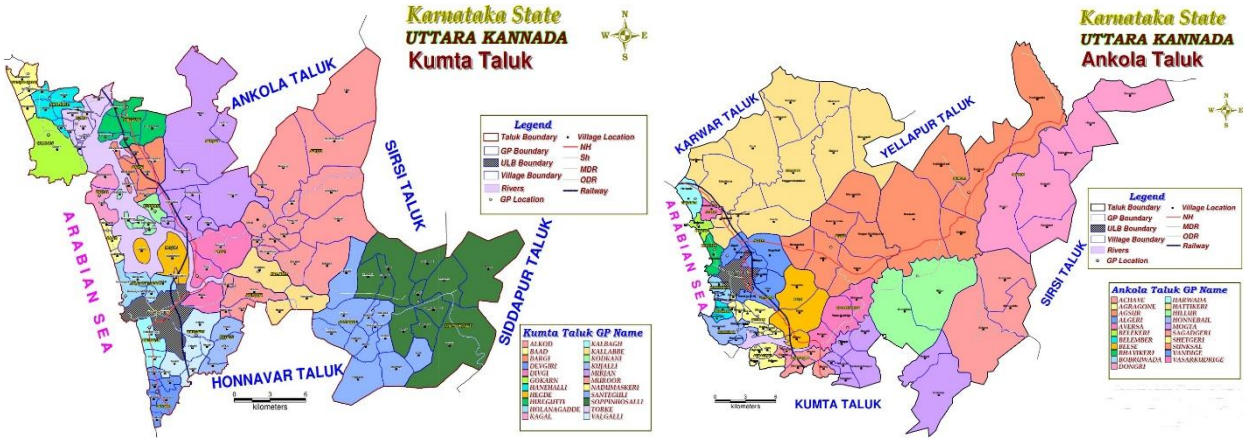

Fig. 1: Map of Study area

Quantitative evaluation of the data

Simpson's Dominance Index (D): A diversity index was proposed by Simpson (1949). The index is based on the concept of dominance. Simpson's dominance index is the measure of the probability that two individuals randomly selected from a sample/community will belong to the same species.

$$D = \frac{\Sigma n(n-1)}{N(N-1)}$$

D = Diversity
n = number of individuals of particular species
N = total number of individuals of all the species in a community

D ranges between 0 to 1. As the value of D increases, diversity decreases.

Simpson's Diversity Index: It measures the probability that two individuals randomly selected from a sample/community will be from different species.

Simpson's Diversity Index = (1 – D)

D = Diversity

Simpson's Diversity ranges from 0 to 1. As the value increases, diversity increases.

Simpsons Reciprocal Index: It is used to indicate the diversity of the sample/ community. It is represented a (1/D)

D = Diversity

The value ranges from 1 to ∞. As the value increases, diversity increases.

Shannon-Weiner Index (H): Shannon-Weiner Index was originally proposed by Claude Shannon in 1948. It is a way to measure the diversity of species in a community.

$$H=\Sigma(Pi*LnPi)$$

Pi = proportion of the individual species = n/N

Ln = natural logarithm

The higher the value of H, the higher the diversity of species in a particular community.

Relative frequency: Relative frequency is the frequency of one species or life form as a percentage of total plant frequency.

$$\text{Relative frequency (R.F.)} = \frac{\text{Frequency of a species}}{\text{Sum of all frequencies}} \times 100$$

Relative density: It is the density of one species or life form as a per cent of total plant density.

$$\text{Relative density (R.D.)} = \frac{\text{Number of individuals of a species}}{\text{Number of individuals of all the species}} \times 100$$

Result and Discussion

Knowledge level of Halakki Vokkaliga tribes on plant diversity

The findings from the table 1 reveal that within Ankola, half (50.00 %) of the respondents in Ankola had medium level of knowledge, more than one third (35.00 %) and 15.00 per cent of the respondents possessed high and low level of knowledge on plant diversity, respectively. Turning to Kumta, more than half of the respondents (58.33%) possessed a moderate level of knowledge. Following this, 28.34 per cent had a low level of knowledge, and only 13.33 per cent of the respondents showed a high level of knowledge in terms of plant diversity.

The results of mean difference between knowledge of respondents of Ankola and Kumta were analysed and it was found that there is a significant difference between the knowledge level of respondents in Ankola and Kumta.

Halakki Vokkaligas cultivate different vegetables, fruits and flowers in their backyard and agriculture land. Since time immemorial, they are well-versed with the naturally available medicine (from plants) and most of them know the use of the different plants and their purpose. They like to have plants in their surroundings, know the multiple use of the plants in their backyard and worship the plants with bio-cultural significance. They are also aware about the varying climate condition, increasing temperature, pollution and measures to increase the plant diversity. This might be the reason for them to have considerably good knowledge on the plant diversity.

The results are in line with the study conducted by Nongrum and Jahanara (2022), Suganthi *et al*. (2013) and Zhasa *et al*. (2015) who reported that most of the tribes had medium level of knowledge. But the result was in contrast to the study conducted by Muratet *et al*. (2015) who found that the knowledge of respondents on plant diversity was poor.

Table 1 : Knowledge level of Halakki Vokkaliga tribes in Ankola and Kumta talukas of Uttara Kannada district

n=120

Sl. No.	Knowledge Level	Ankola (n_1 =60)		Kumta (n_2 =60)		Overall (n=120)		t-test p value
		F	%	F	%	F	%	
1	Low (33 - 39)	09	15.00	17	28.34	26	21.67	0.0008*
2	Medium (40 - 46)	30	50.00	35	58.33	65	54.17	
3	High (47 - 53)	21	35.00	8	13.33	29	24.16	

*Significant at 0.05%

Plant diversity in the backyard of Halakki Vokkaliga tribes

The value of diversity indices in Ankola and Kumta were 0.201, 0.790, 4.975, 2.239 and 0.158, 0.842, 6.329, 2.936 for Simpson's Dominance Index, Simpson's Diversity Index, Simpson's Reciprocal Index and Shannon-Weaver Diversity Index respectively. The results indicated that the value of diversity indices of Kumta depicted the greater plant diversity than Ankola.

Back yards of residents of Ankola were larger than the backyards of residents of Kumta. But the plant species identified in the backyards of residents of Ankola were mostly similar, whereas variety of plant species were identified in the backyards of residents of Kumta. It was observed that most of the respondents who sold flowers were from Ankola since they grew

kanakambaram and jasmine in common. The vegetable crops, fruits and arecanut were seen commonly in the backyard of residents of Ankola due to its economic value where as diverse plant species were noted in the backyards of residents of Kumta. This contributed the greater evenness in plant diversity as compared to Kumta.

Table 2: Simpson's Dominance Index, Simpson's Diversity Index, Simpson's Reciprocal Index and Shannon-Wiener Diversity Index of plant diversity in Ankola and Kumta talukas of Uttara Kannada district

Sl. No.	Place	Simpson's Dominance Index	Simpson's Diversity Index	Simpson's Reciprocal Index	Shannon- Wiener Diversity Index
1.	Ankola	0.201	0.790	4.975	2.239
2.	Kumta	0.158	0.842	6.329	2.936

Relative Frequency and Relative Density of the plants in the backyard of the Halakki Vokkaliga tribes

The results projected in table 3 revealed that the relative frequency of different ornamental plants, vegetables, fruits, medicinal and spice plants in the backyards of Halakki Vokkaliga tribes.

Ornamental Plants

The Halakki Vokkaliga tribes residing in Ankola and Kumta talukas cultivate a variety of ornamental plants in their home gardens. These primarily include climbers and shrubs. Among these, kanakambaram (39.17%) was the most commonly grown, followed by jasmine (35.83%), hibiscus (27.50%), and rose (24.17%).

Vegetables

The tribes also maintain vegetable gardens in their backyards. Snake gourd (16.67%) emerged as the mostly grown vegetable, followed by drumstick (15.00%) and curry leaves (14.17%). Apart from these, vegetables like ivy gourd (8.33%), brinjal (5.83%), and basale leaves (5.83%) were also cultivated.

Fruits

Among fruit-bearing plants, banana (30.00%) and papaya (24.17%) were the most commonly grown by the Halakki tribes. Additionally, fruits such as mango (23.33%) and guava (10.83%) were also found in their home gardens.

Medicinal and Spice Plants

In the backyards of the Halakki tribes, medicinal plants like basil (55.00%) and patre (10.83%) were grown extensively. Other medicinal plants like huchhu bevu (6.67%) and henna (2.50%) were also present. Along with these, spice plants such as bay leaf (10.00%) and pepper (7.50%) were cultivated to meet household needs.

Multi-Purpose and Plantation Crops

Among the Halakki tribes, coconut (49.17%) and arecanut (23.33%) were the most commonly grown plantation crops in their backyards. In addition to these, trees like neem (11.67%), tamarind (7.50%), and bamboo (1.67%) were also cultivated. These plants served multiple purposes such as medicinal use, construction material, and consumption as food.

It was noticed that Kanakambaram in ornamentals, snake gourd and coriander in vegetables, coconut in plantation category had the highest relative frequency and relative density. The tribes sell fowlers and vegetables in daily market. Kanakambaram, snake gourd, coriander and coconut have the economic value and support the living. This might be the reason that these plants are grown in the backyards.

Basil in the category of medicinal plants has highest relative frequency and relative density. The reason may be that basil is worshiped by the tribes and most of them are aware of the medicinal value of basil.

Bay leaf in spice, vanilla in multipurpose and coconut in plantation crop category has the highest relative frequency and relative density. The reason for this would be the economic value of the plants and the climatic condition that supports the growth of the plants.

Table 3: Relative frequency and Relative Density of the plants in the backyard of the Halakki Vokkaliga tribes

n=120

Sl. No.	Common/ local name of the plants	Name of the plant	Frequency	Relative frequency (%)	Abundance	Relative density (%)	Uses
Ornamental							
1.	Jasmin	*Jasminum spss.*	43	4.960	256	3.663	Economic
2.	Rose	*Rosa indica*	29	3.345	60	0.859	Economic/Worship
3.	Nityapushpa	*Catharanthus roseus*	16	1.845	33	0.472	Worship
4.	Ekke	*Calotropis gigantea*	22	2.537	33	0.472	Worship

5.	Hibiscus	*Hibiscus rosa-sinensis*	18	2.076	74	1.059	Worship
6.	Bellflower	*Tecoma stans*	18	2.076	34	0.487	Worship
7.	Kanakambara	*Crossandra infundibuliformis*	47	5.421	2565	36.706	Worship
8.	Sevantige	*Chrysanthemum indicum*	12	1.384	34	0.487	Worship
9.	Jaji	*Jasminum multiflorum*	3	0.346	14	0.200	Worship
10.	Narvelli	*Naravelia zeylanica*	2	0.231	2	0.029	Worship
11.	Pinwheel	*Tabernaemontana divaricate*	15	1.730	26	0.372	Aesthetic
12.	Nandi battalu	*Ervatamia divaricate L.*	7	0.807	12	0.172	Worship/ Aesthetic
13.	Vaate houu	*Artocarpus gomezianus Wall.*	7	0.807	8	0.114	Aesthetic
14.	Gonde hoovu	*Tagetes erecta L.*	7	0.807	17	0.243	Worship/ Aesthetic
15.	Krishna Bale (Passion flower)	*Passiflora incarnata*	10	1.153	21	0.301	Worship/ Aesthetic
16.	Chigare Hoo/ Globe Anaranth	*Gomphrena globose*	5	0.577	6	0.086	Worship/ Aesthetic
17.	Kalli gida	*Euphorbia neriifolia*	6	0.692	11	0.157	Worship/ Aesthetic
18.	Kusumaale	*Ixora coccinea*	7	0.807	19	0.272	Worship/ Aesthetic
19.	Pachhe kadara	*Caesalpinia pulcherrima*	6	0.692	10	0.143	Aesthetic
20.	Raatri raani	*Cestrum nocturnum L.*	7	0.807	20	0.286	Aesthetic
21.	Battalu bale	*Strelitzia reginae*	4	0.461	12	0.172	Aesthetic
22.	Shankhapushpa	*Clitoria ternatea var. albiflora*	10	1.153	30	0.429	Worship/ Aesthetic
23.	Suragi Mara	*Mammea suriga*	6	0.692	7	0.100	Worship/ Aesthetic
24.	Paarijaata	*Nyctanthus arbortristis*	2	0.231	7	0.100	Worship/ Aesthetic
		Vegetables					
1.	Drumstick	*Moringa oleifera*	18	2.076	39	0.558	Economic/Consumption
2.	Coriander	*Coriandrum sativum*	4	0.461	1207	17.272	Economic/Consumption
3.	Palak	*Spinacia oleracea*	2	0.231	550	7.871	Economic/Consumption
4.	Basale	*Basella rubra*	7	0.807	757	10.833	Economic/Consumption
5.	Curry leaves	*Murraya koenigii*	17	1.961	41	0.587	Consumption
6.	Ivy gourd	*Coccinia grandis*	10	1.153	30	0.429	Economic/Consumption
7.	Radish	*Raphanus sativus*	2	0.231	39	0.558	Economic/Consumption
8.	Brinjal	*Solanum melongena*	7	0.807	33	0.472	Economic/Consumption
9.	Snake gourd	*Trichosanthes cucumerina*	20	2.307	30	0.429	Economic/Consumption
10.	Knol kohl	*Brassica oleracea*	3	0.346	37	0.529	Economic/Consumption
11.	Harive soppu	*Amaranthus viridis L.*	3	0.346	28	0.401	Consumption
12.	Genasu	*Ipomoea batatas*	6	0.692	9	0.129	Economic/Consumption
13.	Maragenasu	*Manihot esculenta*	4	0.461	8	0.114	Economic/Consumption
		FRUIT					
1.	Coconut	*Cocos nucifera*	59	6.805	133	1.903	Economic/Consumption
2.	Banana	*Musa spss.*	36	4.152	89	1.274	Economic/Consumption
3.	Papaya	*Carica papaya*	29	3.345	47	0.673	Economic/Consumption
4.	Pineapple	*Ananas comosus*	8	0.923	11	0.157	Economic/Consumption
5.	Mango	*Mangifera indica*	28	3.230	60	0.859	Economic/Consumption
6.	Jackfruit	*Artocarpus heterophyllus*	8	0.923	19	0.272	Economic/Consumption
7.	Lemon	*Citrus limon*	8	0.923	12	0.172	Economic/Consumption
8.	Kanchi	*Citrus medica*	15	1.730	4	0.057	Consumption
9.	Guava	*Psidium guajava*	13	1.499	25	0.358	Economic/Consumption
10.	Bread fruit (beru halasu)	*Artocarpus altilis*	7	0.807	8	0.114	Consumption
11.	Bimbali Kaai	*Averrhoa bilimbi*	6	0.692	7	0.100	Consumption
12.	Guluganji	*Abrus precatorius*	6	0.692	7	0.100	Economic/Medicinal
13.	Seetaphala	*Annona reticulata*	11	1.269	12	0.172	Economic/Consumption
14.	Challehannu	*Cordia myxa*	15	1.730	17	0.243	Economic/Consumption
15.	Jambe hannu	*Syzygium cumini*	5	0.577	6	0.086	Economic/Consumption
16.	Bore hannu	*Ziziphus mauritiana*	4	0.461	5	0.072	Economic/Consumption
		Medicinal					
1.	Tulsi	*Ocimum sanctum*	66	7.612	135	1.932	Worship
2.	Patre	*Aegle marmelos*	13	1.499	15	0.215	Worship
3.	Henna	*Lawsonia inermis*	3	0.346	6	0.086	Medicinal
4.	Huchu Bev	*Melia dubia.*	8	0.923	18	0.258	Medicinal

		Spice					
1.	Palav leaf (Bay leaf)	*Laurus nobilis*	12	1.384	28	0.401	Consumption
2.	Pepper	*Piper nigrum*	9	1.038	22	0.315	Economic/Consumption
3.	Beetle leaves	*Piper betle*	4	0.461	10	0.143	Economic/Consumption
4.	Sarva Sambar	*Pimenta dioica*	3	0.346	6	0.086	Economic/Consumption
		Multi-purpose					
1.	Bamboo	*Bambusa spss*	2	0.231	4	0.057	Construction/Economic
2.	Tamarind	*Tamarindus indica*	9	1.038	11	0.157	Economic/Consumption/Fuel
3.	Money plant	*Epipremnum aureum*	9	1.038	22	0.315	Medicinal/Aesthetic
4.	Neem	*Azadirachta indica*	14	1.615	18	0.258	Medicinal/Worship/Fuel
5.	Vanilla	*Vanilla planifolia*	17	1.961	31	0.444	Economic
		Nuts					
1.	Arecanut	*Areca catechu L.*	28	3.230	81	1.159	Economic/Consumption
		Total	867	100	6988	100	

Multiple response*

Bio-cultural significance of plants

All most all (92.50 %) the respondents believed that basil is sign of wealth and health, 38.33 per cent of the respondents believed that worshiping basil protect their husband from evil eye, nearly one fourth of the respondents believed that it is worshipped due to its medicinal value and 11.67 per cent of the respondents believed that basil brings positivity in life. Nearly one fourth of the respondents believe that banyan tree is the home of many gods (27.50 %), sign of wealth and health (21.67 %), protects their husband from evil eye (20.83 %) and more than half (65.00 %) of the respondents believed that it is the symbol of life and fertility. Half (54.16 %) of the respondent's worship peepal tree as they believe that it brings positivity in life. Half of the respondents (50.00 %) believe that neem is the goddess of smallpox/chickenpox and more than one fourth (38.33 %) of the respondents stated that neem is worshiped due to its medicinal value. Nearly a quarter (22.50%, 26.67% and 22.50%) respondents believe that coconut is pure and symbol of good luck, bilva patre is offered to lord shiva as it is favourite of lord Shiva and crown flower is believed to be the reflection of lord Ganesha respectively. Around 17.50 per cent of the respondents stated that lotus is pure and symbol of good luck. Most of the respondents (95.83%) stated that Banni is worshiped since Pandavas hid their weapons on the tree and is worshipped on Vijayadashami.

Table 4: Bio-cultural significance of the plants n=120

Sl. No.	Belief	Name of the plants worshiped																	
		Basil		Banyan		Peepal		Neem		Coconut		Bilva patre		Lotus		Crown flower		Shami tree	
		F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
1.	Sign of Wealth and health	111	92.50	26	21.67	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	07	5.83	17	14.17
2.	Home of many gods	0	0.00	33	27.50	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00
3.	Symbol of life and fertility	0	0.00	78	65.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00
4.	Protects their husband from evil eye	46	38.33	25	20.83	05	4.17	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	08	6.67
5.	Brings positivity in life	14	11.67	22	18.33	65	54.16	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00
6.	Worshipped for medicinal value	29	24.17	04	3.33	17	14.16	46	38.33	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00
7.	Goddess of smallpox/chickenpox	00	0.00	00	0.00	00	0.00	60	50.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00
8.	Pure and symbol of good luck	00	0.00	00	0.00	00	0.00	00	0.00	27	22.50	00	0.00	21	17.50	00	0.00	00	0.00
9.	Reflection of lord Ganesha	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	27	22.50	00	0.00
10.	Pandavas hid their weapons and worshipped on Vijayadashami (Dasara)	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	115	95.83
11.	Favourite plant of lord Shiva	00	0.00	00	0.00	00	0.00	00	0.00	00	0.00	32	26.67	00	0.00	00	0.00	00	0.00

Conclusion

The plant diversity maintained by the Halakki tribes in the backyard is high and they possess good knowledge on the plant diversity, uses of different plants. The plants in the backyard were mostly vegetables, fruits, medicinal and ornamental which supported their daily living. Few ornamental plants like *Crossandra infundibuliformis* and *Jasminum spss* vegetables like *Trichosanthes cucumerina* and *Moringa oleifera* were considerably grown in the backwards to economically support the living.

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