An Appraisal of Agro-Economic Aspects of Takhatpur Block Using Remote Sensing and GIS Technology

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1. Introduction

Agricultural economics is a branch of the social science of economics that focuses on all facets of agricultural issues (Berton, 2018).Professor Gray approaches agricultural economics as a subset of economics as a whole. It's only one of the sub-disciplines of applied economics. Industrial economics, labor economics, monetary economics, transportation economics, public economics, international economics, and household economics are only a few examples (Runge, 2006).Prof. Gray defines agricultural economics as "the science in which the principles and methods of economics are applied to the special conditions of agricultural industry, " as a subset of the vast field of economics in which primary attention is paid to the analysis of economic problems associated with agriculture.Agricultural economics, according to Prof. Hubbard, is "the study of relationships resulting from man's wealth-getting and wealth-using behavior in agriculture." According to Lionel Robbins, economics deals with problems of allocative productivity, or choosing between different alternative uses to optimize certain given ends, particularly when resources are scarce. As a result, it offers analytical techniques for analyzing various resource allocations among alternative

uses. In a Robbinsian language, Prof. Taylor explains agricultural economics."Agricultural economics is concerned with the redistribution of capital in the agricultural sector, with the alternatives of processing, distribution, or public policy, " according to professor Holerow. Agricultural economists are interested in the analysis of farm production productivity, the returns that can be expected by using different quantities and combinations of inputs in farming, and deciding the best farm production options under defined physical and economic conditions.

In low-and middle-income countries, economic transition is the most prominent aspect of development (Murthy, 2014). The country is transitioning from being mostly rural and agricultural to being mostly urban, with urban industry and services leading the economy.Rapid development in the vast agricultural sector has a significant effect on overall productivity, poverty reduction, and the pace of economic transition in low-income countries (Mole, 2018). Rapid growth in a now comparatively smaller agriculture tends to have a significant effect on overall growth in middle-income countries, but it is also influential in poverty reduction.Rainfed agricultural production has recently been given high priority in many Asian developing countries' strategies, and it continues to play an important role in many African countries', development agendas.Multi-level agricultural systems have farming systems. Group programs and the national agriculture sector are two higher system levels that are central to this debate (Dixon 1990).The degree to which a farming system achieves household objectives is determined, among other things, by management abilities and, in most semi-arid regions, a great deal of luck with the weather and other uncontrollable environmental factors (Anderson and Dillon 1992). It's also worth noting that farming systems are dynamic: they embody the combined interaction of biophysical and socioeconomic elements over time (Norman et al. 1981). According to Bowen (1989), as tourism establishes itself in an agrarian economy, the general opinion is that tourism would phase out agriculture; but, with the arrival of corporate farming and smart farmers, there is a need to combine the agricultural sector's development fate with that of the industry and service sectors.It's impossible to imagine a Pareto Superior technical transition, that is, one in which none of the parties affected by the change are worse off (Hussen, 1979).More output is produced from the same or less inputs as a result of technological change reflected in changing production functions with either shifts in factor shares and/or proportions.Nonetheless, in addition to the positive effects, technological advancement has had certain negative effects on society, such as changes in rural poverty, urban congestion, noise, alienation, violence, and school degradation, to name a few.

Agriculture is one of the most important renewable and dynamic resource in India (Blum, 2013). The survey on agricultural resources is presently conducted to gather reliable and timely information on crops, rangeland, livestock and others agriculture related aspects. Bilaspur district in Chhattisgarh comprises with poor soils, undulating topography steep slopes, high runoff, and medium rainfall (Bhelawe et al., 2014). The intensity of both irrigation and copping is low in this region. With limited irrigation facilities and due to conditions of water logging during the growing season, rice is cultivated even under unirrigated conditions. In the study area, rice has a major share in the total kharif crop, covered by approximately 80% of the net sown area. However, the rising populations, increasing per capita income, high rate of employment, rapidly changing food habits are the key growth drivers for agro and food processing sector in the region. With the rising of population pressure and concomitant need for food and other resources, the qualitative and quantitative information of agro-economic characteristics are essential (Ennouri and Kallel, 2019). Detection, documentation, dimension and monitoring of farming phenomenon are prophesied on the assumption that agricultural landscape features

have reliably discernible signatures on the type of satellite data. Remote sensing data has unique capability to deliver the actual synoptic views over a large area at a time which is unbearable for conventional survey systems and also the progression of data attainment and investigation are very fast through GIS as associated to the predictable approaches (Kingra et al., 2016).

Study Area

Takhatpur block is located in Bilaspur district, Chhattisgarh, extended between 21°58'34.504"N - 22°19'0.235"N latitude and 81°43'43.718"E - 82°7'53.556"E longitude, comprising with 98 Panchayats and 178 villages and there is total 54986 homes in this Block (***Figure 1***). Total area of Takhatpur is 714 km² including 690.00 km² rural area and 24.35 km² urban area.

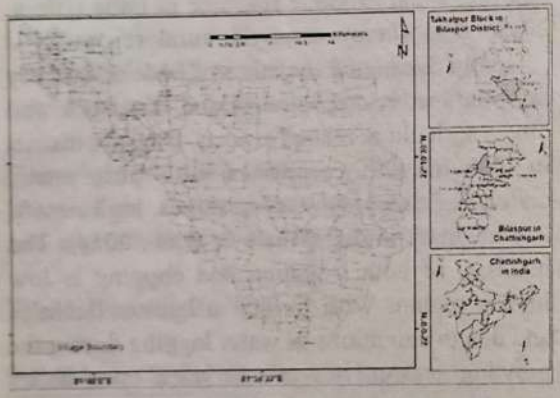

Figure 1: Location map of Takhatpur block of Bilaspur district, Chhattisgarh

Results

Estimation of Arable Land from Remote Sensing Data

In the study area, total area of crop land is estimated as 359.89 km². The maximum density of crop land is observed in the central and eastern part of the block. The low crop land area is demarcated in the west and north-west. The maximum area of crop land is recorded from the Nirtoo village (7.97km²), followed by Pondi Village (6.72km²), and Udela Village (6.30km²). Moreover, the lowest area of crop land is documented from the Kamoda village (0.04km²), followed by Barahi Village (0.072km²), and Chulghat Village (0.073km²). The spatial distribution of crop land in Takhatpur lock is illustrated in Figure 3.

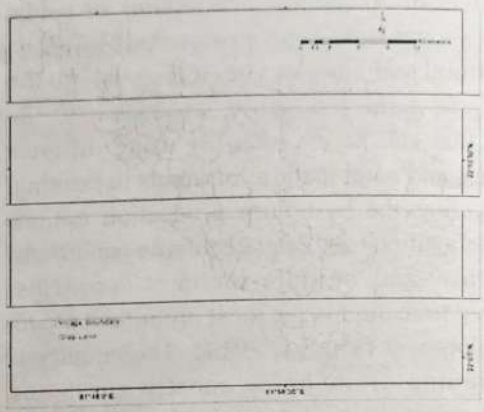

Figure 3: Distribution of crop land in Takhatpur Block of Bilaspur district

1.1 Spatial Analysis of Worker Status

This includes the study of population residing in the smaller areas, units as well as the study of total number of inhabitants (Bogue, 1959). Population distribution we mean geographical and spatial study of distribution of population of a territory and the way in which the people are distributed over it. When, however changes take place in the existing pattern of population distribution, it is called population regardless of boundary determining criteria.

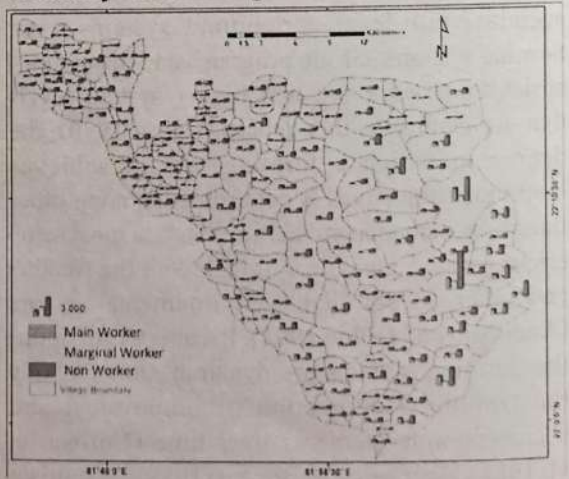

Figure 4: Spatial distribution of worker status of Takhatpur block

Figure 4 shows the worker status in Takhatpur block. The maximum number of non-workers are observed in the east of the study area. Most of the main workers are observed in the north-east of the study area. Central and northern part of the study area having very a smaller number of main and marginal workers. The mean main worker/village of the study area is calculated as 345. The average cultivator per village is calculated as 154 with standard deviation of ±126 (Table 2). The average marginal and non-worker per village is calculated as 159 and 611 respectively.

The concept of literacy, that varies from country to country, generally refers to the minimum level of literacy skills. This minimum level of skills varies from ability to communicate orally, to make a check of a variety of difficult arithmetic computations. However, the length of schooling has often been considered as a basis of distinguishing between a literate and illiterate (Trewartha, 1969). Table 2 shows the general characteristics of population in the study area. The average household per village is calculated as 210. The average number of literacy is calculated as 531±603 and illiteracy is calculated as 586±507 in the study area. The average number of population is calculated as 1117 in the study area.

Table 2: Descriptive characteristics of population characteristics

Population characteristics	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness
Household	210.18	14.97	155.00	200.30	16.84	3.34
Population	1117.25	81.60	828.00	1091.74	18.48	3.50
Literacy	531.31	45.09	366.00	603.21	25.86	4.18
Illiteracy	585.89	37.89	471.00	507.00	11.33	2.71
Total worker	505.61	32.62	395.00	436.39	11.68	2.76
Main worker	345.99	22.32	275.00	298.58	10.50	2.51
Cultivators	154.46	9.45	116.00	126.49	2.61	1.52
Agricultural Labour	121.34	9.17	94.00	122.73	12.28	2.59
Marginal Worker	159.62	14.97	89.00	200.25	5.47	2.16
Non-Worker	611.56	50.10	440.00	670.25	26.14	4.17

1.2 Spatial analysis of Population density

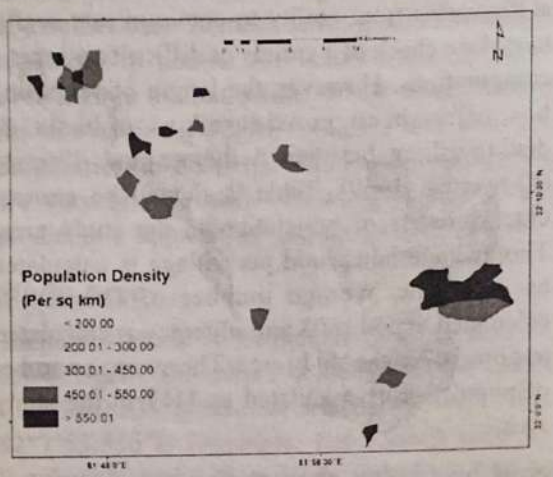

Figure 5: Spatial distribution of population density in Takhatpur block

1.3 Spatial analysis of irrigated land

Based on the availability of irrigational land, the study area is divided into five major classes, like (i) <50 hect, (ii) 51 – 100 hect, (iii) 101-150 hect, (iv) 151 – 200 hect and (v) >201 hect (Figure 6). The maximum area of irrigated land is observed in the north-west, north and small pockets of central part of the block. The north-east and south of the Takhatpur block having very less area of irrigated land.

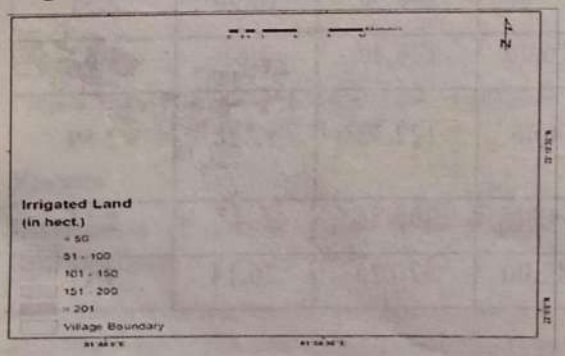

Figure 6: Spatial distribution of irrigated land

1.4 Spatial analysis of Agriculture Density

The agriculture density represents the number of people engaged in agriculture per unit of cultivated land at particular time. The spatial distribution map of agricultural density is represented in Figure 7. Based on the agricultural density, the study area is divided into five categories based on the geometric interval, such as (i) <16.83 km², (ii) 16.84 – 72.65km², (iii) 72.66 – 260.64km², (iv) 260.65 – 893.75km², and (v) >893.76km² The highest value of agricultural density determines, the maximum number of people engaged in agricultural activities (Figure 7). Most of the study area showed low agricultural density, distributed in the central and northern part of the block, shown in green colour. The highest agricultural density villages are distributed heterogeneously south and south-east in the study area. The blocks having an average agricultural density of 145.52 km²with a standard deviation of ±253.78. The highest agricultural density is calculated for the Nagoi village (3025.93km²), followed by Pandariya village (1753.66km²) and Jareli village (1375.42km²). This may be attributed to the mechanized agricultural activities in the study area. The lowest agricultural density villages are documented as Bhowakapa village (0.26km²), followed by Beltookri village (0.28km²) and Parsada village (0.37km²).

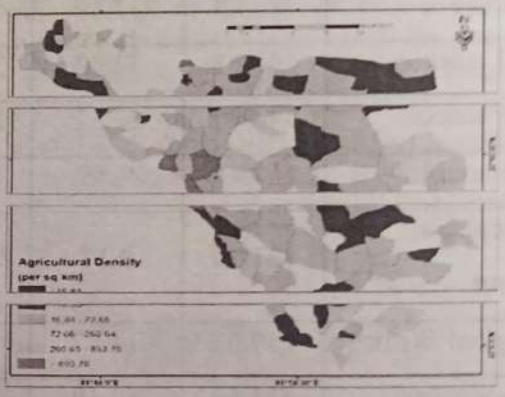

Figure 7: Distribution of agricultural density in Takhatpur Block of Bilaspur district

1.5 Spatial analysis of Nutritional Density

The average nutritional density of the study area is calculated as 1124.29 km² with a standard deviation of ±1428.46. Based on the nutritional density, the study area is divided into (i) <407.47 km², (ii) 407.48 - 477.60 km², (iii) 477.61 - 864.94 km², (iv) 864.95 - 3004.28 km² and (v) > 3004.29

km²(Figure 8). The highest nutritional density is intended for the Nagoi village (14820.18 km²), followed by Pandariya village (8089.21km²) and Bija village (7799.07 km²).

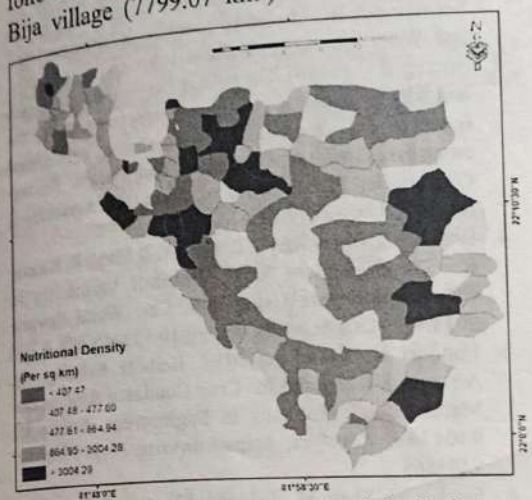

Figure 8: Distribution of nutritional density in Takhatpur block of Bilaspur district

That may be attributed to the limited amount of arable land and availability of large population in the study area. The lowestnutritional density villages are recognized as Achanakpur village (20.12 km²), followed by Panda Kapa village (33.08km²) and Dabena village (36.54km²). The highest nutritional density is observed in the north-central and east of the block. The lowest value of nutritional density is found in the central and north of the study area.

Table 3: Descriptive characteristics of population resource characteristics

	Mean	Standard Error	Median	Standard Deviation	Kurtosis	Skewness
Population Density/ sq km	298.40	15.02	261.75	200.90	9.77	2.52
Agricultural Density/ sq km	3.46	0.76	1.20	10.19	57.07	7.17
Nutritional Density/ sq km	0.34	0.04	0.18	0.57	28.62	4.72

1.6 Spatial correlation

Finally, a statistical correlation has been done between agro-economic aspects and population characteristics. Results showed the inverse relationship between population density with AD (r=-0.24, P=<0.05) and ND (r=-0.36, P<0.05). A positive and strong relationship is observed between AD and main agricultural labour (r=0.37) and main worker (r = 0.19). An inverse relationship is also observed between illiteracy with AD (r=-0.20, P=<0.05) and ND (r=-0.31, P<0.05) in the study area. Results also showed negative correlation between AD and marginal worker (r= -0.26). Understanding the agro-economic characteristics lets us understand how much food is being produced in an area for the people land supports. This information also allows region to understand the pressure that may occur in densely populated areas and where the agriculture and living spaces are coincide.

Discussion

Population distribution over a region is intimately related to its physical and non-physical determinants. The geographer s task is to explain the diversity of this distribution in terms of all those influences in population distribution that has been ever changing and its cause and effect which vary with time and space.Population is unevenly distributed throughout the region. The agricultural sector is the backbone of the rural Indian economy, and any changes in its structure are likely to have an effect on the current trend of social inequality. Without sustainable and broad-based agricultural growth, which is vital for economic change, no economic reform plan can succeed.

- raising living standards,
- alleviating hunger,
- ensuring food stability,
- creating a thriving market for industry and services development, and
- contributing significantly to national economic growth

Economic appraisal is a comprehensive method for evaluating alternate resource uses, with an emphasis on assessing requirements, goals, alternatives, expenses, incentives, threats, financing, affordability, and other decision-making considerations. Small farmers have emerged as the size group with the highest share of land,

accounting for 33.97 percent of total land, which has nearly doubled in the last decade. In 1990-91, the Large Farmers accounted for 1% of all landowners, but they owned nearly 13.83 percent of all land. The emergence, and potentially growing influence, of a small but dominant and prominent minority in agriculture represents the other side of the marginalization mechanism, according to a fascinating but speculative conclusion.

The study reveals that low to high, very low to very high and low to moderate change in density is a result of favorable soil and abidance of surface water which resulted into agricultural development leads to in-migration. The very high physiological density is mainly due to the very fertile soils, irrigation and transportation facilities.The very high and high concentration of population is a result of the fertile soil development of irrigation facilities, education and small and large scale industry.

Conclusion

It is apparent that agriculture is one of the most important aspect of the humanity life and has substantial control on economy. This highlights the procedure prerequisite for customary monitoring of the crop state. Suitable and appropriate crop assessment at better level necessitates detecting extensive regions by a authoritative system. Remote sensing and GIS technology provides this through non-destructive synoptic screening measurements. These sensed measures support vaguely in the recognition and detection of the earth surface trait. However, gaining the crop condition data at early steps of crop growth is still more important than attaining the static creation after harvest period. With the help of satellite and digital imaging process and GIS analysis, it is modest and also low cost-effective in planning and observing the agro-economic situation for sustainable development.

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Basic Sanitation Services of Dharsiwa Tehsil of Raipur Block C.G

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Introduction

A sanitation system includes the capture, storage, transport, treatment and disposal or reuse of human excreta and wastewater. Reuse activities within the sanitation system may focus on the nutrients, water, energy or organic matter contained in excreta and wastewater. Basic sanitation services are calculated by multiplying the proportion of the population using improved sanitation facilities by the proportion of improved sanitation facilities which are not shared among two or more households. In 2017, 45 per cent of the global population (3.4 billion people) used a safely managed sanitation service; that is, an improved toilet or latrine which is not shared, from which excreta are safely disposed of in situ or treated off-site. 2.0 billion People still lacked even a basic sanitation service, defined as use of improved sanitation facilities which are not shared with other households. 673 million people used no sanitation facility at all, and continued to practise open defecation. From 2000-2017 the population using basic sanitation services increased by over 2 billion people, or 1.02 percentage points per year. Urban-rural disparities persist: 7 out of 10 people that do not use basic sanitation services live in rural areas. Globally 2.3 billion people live without access to a basic sanitation service: almost 892 million of these people practice open defecation. Despite significant gains — over 2.2 billion people gained access to improved toilets or latrines since 1990 — sanitation was one of the most off-track

Millennium Development Goals (MDGs) globally. Today, only 68% of the world's population has access to basic sanitation, and only 39% of people have access to safely managed sanitation (which includes containment, through safe collection and conveyance, to treatment and end use/disposal).

Some 827 000 people in low- and middle-income countries die as a result of inadequate water, sanitation, and hygiene each year, representing 60% of total diarrhoeal deaths. Poor sanitation is believed to be the main cause in some 432 000 of these deaths. Diarrhoea remains a major killer but is largely preventable. Better water, sanitation, and hygiene could prevent the deaths of 297 000 children aged under 5 years each year.Open defecation perpetuates a vicious cycle of disease and poverty. The countries where open defection is most widespread have the highest number of deaths of children aged less than 5 years as well as the highest levels of malnutrition and poverty, and big disparities of wealth.

In general, sanitation corresponds to the availability of facilities and services for the safe and clean management of human feces and urine (Jain et al., 2020). Unhygienic sanitation and unhealthy water-borne diseases account for about 10 per cent of the global disease burden (Minh and Hung, 2011).An enhanced sanitary facility distinguishes human excretions hygienically from human contact.Diarrheal infections, trachoma and schistosomiasis are linked of faecal infection. Fecal exposure was related to stunning, a metric of linear growth delay that is commonly used to estimate long-term educational and economic effects (Sudfeld et al., 2015).By 2000 the international community dedicated itself to halving by 2015 by the Millennium development goals (MDGs), the proportion of people without access to clean water and basic sanitation (United Nations, 2006).Globally, the water MDG will be on track, but the sanitation aim has major gaps.In developing countries, policymakers prefer not to see improved sanitation as a critical requirement for economic growth or a means of improved health, and cost benefit analysis has not been widely used to support increased spending on sanitation services (Srivastava et al., 2015).A lack of sanitation also holds back economic growth. Poor sanitation costs billions to some countries, amounting to the equivalent of 6.3% of GDP in Bangladesh (2007), 6.4% of GDP in India (2006), 7.2% of GDP in Cambodia (2005), 2.4% of GDP in Niger (2012), and 3.9% of GDP in Pakistan (2006). The economic losses are mainly driven by premature deaths, the cost of health care treatment, lost time and productivity seeking treatment, and lost time and productivity finding access to sanitation facilities. Pollution resulting from improper disposal and treatment of wastewater and domestic fecal sludge also affects both water resources and ecosystems.

Providing millions of citizens with ecologically safe sanitation is an important challenge, particularly in the second most populous country in the world. Environmental sanitation involves improving community health by creating a safe environment and disrupting the contamination chain (Kumar et al., 2011).In India, the Joint Surveillance Network of the World Health Organisation (WHO) reported that about 520 million people annually defecated from open doors in 2015.In rural areas, where 69 percent of households said they did not own a latrine in 2011, the issue is of special concern (Census of India 2011).In India, 59.5% had recourse to "at least basic sanitation" in 2017. Between 2014 and 2019, India's NDA government constructed about 110 million toilets across India, leading basic sanitation coverage to rise from 38.7% in October 2014 to 93.3% in 2019 (Hutton et al., 2020).Despite recent development, India still has even less access to better sanitation relative to many other countries with comparable or even lower per capita gross national income (Gomez et al., 2019).The extent of the dilemma is especially overwhelming in rural areas, with 74 percent of the rural population already defecating in the open. Cash income is very poor in these conditions and the thought of constructing a defecation infrastructure in or near the house does not seem

normal. In addition, because of inadequate sanitation, India is losing billions of dollars annually (Mara et al., 2010). In terms of productivity reductions and costs on medications, child welfare, and funerals, diseases are expensive for households and the economy as a whole (Minh and Hung, 2011).The economic toll is also visible in comparison to the cost of water treatment, reductions in the development of fishing and aquaculture, and health consequences, including declining primary education, inconvenience, wasting of time and lack of security and safety for women. The Government of India clearly recognises the value of improving household sanitation and has assisted this initiative with increased resource levels.

Mapping is used as a lobbying mechanism to offer knowledge and reasons to residents and municipal councils to demand better services and enhance the quality and fairness of service delivery at an administrative level (Ntozini et al., 2015). With the rising population, without any basic infrastructure planning, settlements are growing haphazardly; the process of sanitation planning in rural and urban areas becomes very necessary. To determine the demand-supply gap that will become the basis for potential planning and rejuvenation of sanitation services, the local authority needs updated information on accessible sanitation facilities. Based on the above discussion, present study analyze the existing scenario of sanitation condition and associated phenomenon such as demographic, socio-economic, behaviours, attitude, experiences and knowledge of sanitation.

Benefits of Improving Sanitation

Benefits of improved sanitation extend well beyond reducing the risk of diarrhoea. These include:

- reducing the spread of intestinal worms, schistosomiasis and trachoma, which are neglected tropical diseases that cause suffering for millions;
- reducing the severity and impact of malnutrition;
- promoting dignity and boosting safety, particularly among women and girls;
- promoting school attendance: girls' school attendance is particularly boosted by the provision of separate sanitary facilities; and
- potential recovery of water, renewable energy and nutrients from faecal waste.

A WHO study in 2012 calculated that for every US$ 1.00 invested in sanitation, there was a return of US$ 5.50 in lower health costs, more productivity, and fewer premature deaths.

Study Area

The DharsiwaGram Panchayatis located in Raipur district of Chattishgarh (India), extended between 81°36'59.476"E - 81°40'32.636" Elongitude and 21°7'45.868"N - 21°10'55.004" Nlatitude*(Figure 1)*. Dharsiwa is a legislative assembly constituency in the Indian state of Chhattisgarh. Dharsiwa village is situated in Teshil Raipur, District Raipur and in State of CHHATTISGARH India. Village has population of 4057 as per census data of 2011, in which male population is 2085 and female population is 1972. Dharsiwa Tehsil is covered by 652.31 sq km with 84 villages and 78 Gram Panchayat. Kandul, Kathadih, Datrenga and Doma fall under this Tehsil. The land rises and merges with the Chotonagpur plateau on the northern side and the Decan plateau on the southern side of the city. The area is located in the central part of Chhattisgarh and is made of proterozoic rock structural plain, mature river valley, flood plains of various Mahanadi river system tributaries and some isolated hills and ridges.The region is experienced by tropical wet and dry climate. The hot and dry winds experienced in summer month (March to June). May is the warmest month and the windiest month is known as June. The city receives rainfall of around 1300 mm, mainly during the monsoon season (June to early October). Major crops in the district are paddy. Besides maize and millets are others cereals grown in small area. Agriculture and animal husbandry are primary economy activities in the study area. Agricultural land is irrigated by canals, bore-holes and tube well.

Figure 1: Location map of the DharsiwaGram Panchayat in Raipur district, Chattisgarh

Results

.1 Bath Place availability

ata relating to the place of bathing, it is clear at 66% households take their bath in the surface ater, except in Kandul village (30%).25% of the mple households used bathroom and remaining .5% take their bath in the other sources of ater. The majority percentage of the households Doma village take their bath in surface water 2%). 30% of the households in Kathadih village ed bathroom and 42% of the sample households ed others in Kandul village (Table 5).

Table 5: Summary of Bath place availability in the study area

lage me	Surface water (%)	Bathroom (%)	Others (%)	F-test	P-Value
thadih	66	30	4	4.001	0.07
ndul	30	28	42		
renga	66	22	12		
ma	82	10	8		

1.2 Presence of Toilet

Form the compiled table 6, the data shows that large portion of households i.e., 96% sample households in Kandul village have latrine facility in their house, followed by Kathadih village (78%). In Datrenga village there is 70% facility, followed by Doma village (60%). And 40% sample households in Doma village have no latrine in their house, followed by Datrenga village (30%).

Table 6: Summary of the presence of toilet in the study area

Village Name	Yes (%)	No (%)	F-test	P-Value
Kathadih	78	22	11.15	0.028
Kandul	96	4		
Datrenga	70	30		
Doma	60	40		

1.3 Location of Toilet

From the compiled table 7 data source that 18% latrines of sample households in Katadih and Datrenga village are located inside the house, followed by 16% latrines are located in Kandul village. 38% latrines of sample households in Kandul village, followed by Katadih village (36%) are located attached to the house. 26% of latrine of the sample households in Datrenga village are observed near to house, followed by Kandul village (20%). Majority of the percentages of latrines located far from the house, percentage are almost same in all sample villages

Table 7: Distribution of households based on Location of the Latrine

Village Name	Inside House (%)	Attached with Room (%)	Near House (%)	Far from House (%)	F-test	P-Value
Kathadih	18	36	18	28	3.71	0.061
Kandul	16	38	20	26		
Datrenga	18	22	26	34		
Doma	10	22	16	52		

1.4 Latrine Used by Households

From the above table 8, it is clear that 76% of the sample household's in Kandul village all members used latrine, followed by Katadih village (70%). 24% households in Datrenga village female

members used latrine, followed by Katadih village (20%).Remaining 22% sample households in Doma village don't use latrine. In Kantadihi village only few members use the latrine.

Table 8: Distribution of households based on Uses of Latrine

Village Name	All (%)	Female Member (%)	None (%)	F-test	P-Value
Kathadih	70	20	10	4.25	0.0004
Kandul	76	12	12		
Datrenga	56	24	20		
Doma	60	18	22		

1.5 Hand wash after Toilet

From the table 9, it noticed that 86% of sample households in Kathadih village wash their hand after defecation or poop, followed by Kandul village (82%).24% of the sample households in Datrenga village respondent don't wash their hand properly after defecation, followed by Doma village (22%).

Table 9: Distribution of households based on Hand washing after using toilet

Village Name	Yes (%)	No (%)	F-test	P-Value
Kathadih	86	14	7.7	0.002
Kandul	82	18		
Datrenga	76	24		
Doma	78	22		

1.6 Construction of Latrine

From the compiled table 10 data source that 78% sample households in Katadih village construct their latrine by free Govt. Scheme, Kandul village (74%) and Doma village (70%). Remaining 32% sample households in Datrenga village construct their my own effort, Doma village (30%).

Table 10: Distribution of households based on Construction of Latrine

Village Name	Own Effort (%)	Under Govt. Scheme (%)	F-test	P-Value
Kathadih	22	78	7.7	<0.00007
Kandul	26	74		
Datrenga	32	68		
Doma	30	70		

1.7 Toilet Cleaning Awareness

From the compiled table11, data source that overall 46% used water for cleaning latrine, followed by 34% used harpice, 13.08% used Phenyl, 8% used bleaching powder and remaining 14% used Dettol to clean their latrine. The maximum number of households used Harpic in Doma village (34%). 12% of sample households in Datrenga village used bleaching power for cleaning latrine, followed by 10% in Kandul village.

Table 11: Distribution of households based on Material use for cleaning Latrine

Village Name	Harpic (%)	Bleaching Powder (%)	Phenyl (%)	Dettol (%)	Water (%)	F-test	P-Value
Kathadih	32	4	12	6	46	27.36	<0.0002
Kandul	26	10	20	8	36		
Datrenga	30	12	8	12	38		
Doma	34	8	12	14	32		

1.8 Household Pan Condition

From the above table 12 data source that out of the total Latrine of the sample households, in the context of pan condition of the latrine.The maximum percentage of broken pan is observed in Datrenga village and no broken pan is observed in Kandul village. 22% of sample households in Doma village having no pan and 14% in Datremga village. 12% f the sample households in Datrenga village pan are chocked.

Table 12: Distribution of households based on Pan Condition

Village Name	No Pan (%)	Broken (%)	Not broken (%)	Chocked (%)	Others (%)	F-test	P-Value
Kathadih	10	4	72	10	4	3.478	0.001
Kandul	6	0	90	2	2		
Datrenga	14	20	48	12	6		
Doma	22	10	46	10	12		

1.9 Availability of Pit

From the compiled table 13, data shows that out of the total Latrine of the sample households 30.95% Latrine have two Pit, followed by 23.21% have one pit, 18.45% have three Pit in their Latrine. 13.69% Latrine have no pit. The poor condition of Latrine construction observed in Doma village, where 24% no pit in their Latrine, followed by Katadih village where 20% Latrine have no pit.

Table 13: Distribution of households based on No. of Pit

Kathadih	20	30	24	8	0	18	4.96	0.004
Kandul	16	22	36	16	4	6		
Datrenga	0	20	28	38	4	10		
Doma	24	14	34	10	6	12		

1.10 Reason of Open Defecation

Table14 is concerned with reason of open defecation. From the table, it is clear that 28% defecate in open place in Datrenga and Doma village because they have no toilet in their house. 24% defecate in open place in Datrenga village, followed by Kathadih village (12%) as the latrines are under construction or incomplete. 30% of the sample households in Kathadih and Kandul village don't use toilet for established old age practice. This tendency is prevalent in kandul village (50%).11.12% don't use toilet because of inadequate households' latrine(IHHLs).18% of sample households in Doma village don't use toilet and prefer open defecation get roam, get fresh air and for walk. The tendency more prevalent in Katadih village. 10% of sample households in Doma village don't use toilet in emergency.

Table 14: Distribution of households based on Reason of open defecation

Village Name	No Toilet (%)	Incomplete Construction (%)	Lack of awareness (%)	Old Age People (%)	Maintenance (%)	enough space	Emergency	F-test	P-Value
Kathadih	14	12	18	28	8	14	6	4.97	0.002
Kandul	22	10	18	32	10	4	4		
Datrenga	28	24	16	12	4	8	8		
Doma	28	10	12	16	6	18	10		

Discussion

Limited data available on this topic suggests that a large proportion of wastewater in developing countries is discharged partially treated or untreated directly into rivers, lakes or the ocean. Wastewater is increasingly seen as a resource providing reliable water and nutrients for food production to feed growing rural and urban populations. Inequalities in access are compounded when sewage removed from wealthier households is discharged into storm drains, waterways or landfills, polluting poor residential areas.

53.5% sample households defecate in toilet and remaining 46.5% who defecate in open field and open place. The majority person (72%) use toilet in Kandul village and majority person who defecate in open place (58%) are in Doma village, followed by Datrenga(56%).17.2% defecate in open place because they have no toilet in their house. 26.8% defecate in open place as the latrines are under construction or incomplete. 12.2% don't use toilet for established old age practice. This tendency is prevalent in kandul village (50%). 11.12% don't use toilet because of inadequate households latrine (IHHLs).4.3% don't use toilet and prefer open defecation get roam, get fresh air and for walk. The tendency more prevalent in Kandul village. 11.82% don't use toilet because they have not enough water in their house. 8.6% households use toilet only for emergency.46.72% used water for cleaning latrine, followed by 31.7% used harpice, 13.08% used Phenyl, 7.47 % used bleaching powder and remaining 0.93% used Dettol to clean their latrine. that 80.5% wash their hand after defecation or poop and 19.5% respondent don't wash their hand properly after defecation. The percentage have been seen in Datrenga (24%) followed by Doma(19.5%).61% households take their bath in the surface water, followed by 22.5% used bathroom and remaining 16.5% take their bath in the other sources of water. The majority percentage of the households in Doma village take their bath in surface water(82%).29.77% latrines are located far from the house, followed by 21.42% latrines are located near the house, 33.33% latrines are located attached to the house and remaining 15.48% latrines are located inside the house of the sample households. Majority of the percentage of latrines located far from the house, percentage are almost same in all sample villages.

Recently, there has been a shift away from centrally planned provision of infrastructure towards demand-led approaches that create and serve people's motivation to improve their own

sanitation. Although sound technological judgment about appropriate solutions remains essential, appropriate programming approaches are now more important and contribute most to the success of sanitation work. Some of the most promising approaches that apply to both rural and urban sanitation are described below. Regarding the costs of these demand-led approaches, there are few published comparative studies, but sector professionals estimate that they cost less than traditional infrastructure provision.Improved sanitation brought multiple economic benefits, which included: (1) direct economic benefits of avoiding illnesses (the amount of money that is saved from healthcare expenses); (2) indirect economic benefits, which included a decrease in work days lost to illness and a longer lifespan, because these benefits enabled people to work more; and (3) non-health benefits such as time.

Recommendation

- Community-led total sanitation (CLTS) is a communications-based approach that aims to achieve "open defecation–free" status for whole communities rather than helping individual households to acquire toilets.
- Community Health Clubs aim to change sanitation and hygiene attitudes and behaviour through communal activities.
- The increased demand created by sanitation marketing, CLTS, and Community Health Clubs can be met by the development of a vibrant local private sector for producing, marketing, and maintaining low-cost toilets
- Urban sanitation is much more complex, mainly because of higher population densities, less-coherent community structures, and the absence of opportunities for open defecation. Urban sanitation must extend beyond the household acquisition of a toilet to a systems-based approach that covers the removal, transport, and safe treatment or disposal of excreta
- Sanitation promotion is one of the most important roles the health sector can have in environmental health planning, because behaviours must be changed to increase householders' demand for and sustained use of sanitation, especially in rural areas where the pressure for change is lower.
- Finally, the well-honed epidemiology and surveillance skills of health professionals must also now be applied to sanitation to establish clear links between national health information systems and sanitation planning and financing, which has historically been separate from health in most countries
- For better housing condition Government should provide Pucca house by various Govt. Scheme.
- To improve the awareness level about sanitation of the people education system should be reformed, sanitation related education is needed in basic education so that the people's awareness level about sanitation to improve health and hygiene.
- Availability of toilet facility play a crucial role to improve sanitation. So efforts should be taken to provide increased subsidy for construction of toilet or free distribution of toilet to the villagers.

Conclusion

As per as space for toilets can be adopted where the needy had been by the Gram panchayat with space. Increased cost also creates a headache in the minds of villagers especially in poor people who want to make toilet. Besides financial support cab is provided from panchayat funds. Some social sanctions need to be enforced at community level against the practices of open toilet. Decomposing pit is the easiest technique of solid waste management. The administration should try to make people adopt this method of solid waste management. Policy makers, development partners, as well as the general population, should act now to improve the current sanitation situation, especially in developing countries. As several low-cost sanitation options are available, a good strategy would be to encourage people in poorer

areas to start with the simplest types of sanitation and then to progress over time towards higher specification and higher cost ones. Since the evidence that we have at our disposal today is based on a number of assumptions, more detailed studies are needed to produce more precise estimates on the cost and benefits of these sanitation measures, and how they relate to other relevant factors.

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Sl. No.	Title of paper	Name of authors	Dept. of authors	Name of Journal	Year of publication	ISSN number	Link
1	INSECTICIDE RESISTANCE IN CULEX QUINQUEFASCIATUS MOSQUITO IN BILASPUR CITY CHHATTISGARH	(1) Dr. Santosh Kumar Agarwal (2) Dr. Vivek Mohan Agarwal	Zoology	SHODHASAMHITA: Journal of Fundamental & comparative research	2022	2277-7067	Print Journal only

Sl. No.	Title of Book	Name of authors	Dept. of authors	Name of Publisher	Year of publication	ISBN number	Link
1	Advanced Research and Review in Zoology & Entomology Sciences (Volume-1)	(1) Dr. Vivek Mohan Agarwal (2) Dr. Deepak Rawal	Zoology	Bright Sky Publications New Delhi	2022	978-93-92804-16-8	https://doi.org/10.22271/bs.book.66

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Preliminary Phytochemical Evaluation for Glycosides in Bark of Selected Local Trees of Korba and Janjgir-Champa District Border Region

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ABSTRACT
Herbal biomolecules are chemicals that have definite biomolecules including alkaloids, terpenoids carbohydrates,proteins,lipids, glycosides,essential oils etc. Herbal glycosides are secondary metabolites including cardiac glycosides , anthraquinone glycosides ,coumarin glycosides , cyanogenic glycosides, flavonoid glycosides, phenolic glycosides and saponin glycosides . Herbal glycosides are used as medicines and therapeutic agent. Present investigation was undertaken with the main objective to preliminary phytochemical screening of herbal glycosides in the bark of selected local trees Pongamia pinnata, Terminalia arjuna, Bridelia retusa, Soymida febrifuga and Cassia fistula in 50% ethanolic-hydro extract.

Keywords
Herbal glycoside, Aglycone, phytomedicines, cardiac glycosides,ethanomedicinal.

I. INTRODUCTION

A glycoside is an organic compounds usually of plants origin and comprising a sugar portion linked to a non-sugar moiety in a particular manner. The non-sugar moiety is called aglycone or genin,whereas sugar part is known as glycone. The linkage between the sugar and the aglycones is a hemiacetal linkage formed by the reducing group (usually aldehydes or keto group) of the sugar and alcoholic or phenolic hydroxyl group of the aglycone. The aglycone part is responsible for physical, chemical,therapeutic and pharmacological activity. Whereas sugar facilitates the solubility and absorption of the glycoside helping it to reach the site of action (Amul Kumar Dhara et.al. 2022 and pharmacotutor org.) Glycosides are soluble in water and dilute alcohol and easily hydrolysed by mineral acid, water and enzyme (glycoside hydrolases, glycosyl transferases).Classification of the glycosides is given based on linkage and aglycone part in table 1.1 and 1.2 respectively.

Table – 1.1

Classification of Glycosides based on linkage

Types of Glycoside	Glycone + Aglycone	Glycosidic linkage	Examples
C- Glycosides	Glycone –**OH** + **HC**-Aglycone	Glycone-**C**-Aglycone + H_2O	Cascaroside (Anthraquinone glycoside)
O- Glycoside	Glycone –**OH** + **HO**-Aglycone	Glycone-**O**-Aglycone + H_2O	Senna, Rhubarb
S- Glycoside	Glycone –**OH** + **HS**-Aglycone	Glycone-**S**-Aglycone + H_2O	Sinigrin (Isothiocynate Glycoside)
N- Glycoside	Glycone –**OH** + **HN**-Aglycone	Glycone-**N**-Aglycone + H_2O	Nucleosides of **DNA** and **RNA**

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Table – 1.2
Classification of Glycosides based on Aglycone (Genin)

Types of Glycoside		Glycone	Aglycone	Examples
Cardiac glycosides		Sugar (Digitoxoe)	steroidal nucleus	Digitoxin (Digitalis)
Anthraquinone glycosides		Sugar	Derivative of polihydroxy anthraquinone	Senna, Rhubarb and Aloes
Coumerin glycosides		Sugar	Coumerin (Benzopyrone ring)	Psoralin, Corylitolin (Psoralia corylifolia)
Cynogenic glycosides		Sugar	Cynide (CN) (Benzaldehyde cyanohydrin)	Amygdalin (Almonds)
Flavonoids glycosides	Nesperidin	Rutinose	Hesperetin	Hesperedin
	Naringrin	Rutinose	Naringenin	Naringrin
	Rutin	Rutinose	Quercetin	Rutin
	Quercitrin	Rhamnose	Quercetin	Quercitrin
Phenolic glycoside		Sugar	Simple phenolic	Arbutin (Berberry)
Thioglycosides		Sugar	Sulpher	Sinigrin (Black musterd)
Saponin glycosides		Sugar	Steroidal or Terpenoidal nucleus	Diosgenin (Dioscorea bark)

Herbal glycosides are widely used as phytomedicines for the treatment of a variety of diseased conditions. flavonoids contained in berries may have a positive effect against parkinson's disease and may help to improve memory in elderly people (Shashank Kumar and Abhay Kumar Pandey:2013).Long term users of digioxin appear to have a significantly reduced risk to develop prostate cancer (Oliverkeep et al:2012). The border region of Korba and Janjgir- Champa district is speciefic for its vegetation including various herbs, shrubs and trees. The bark of some trees are being used as medicines and therapeutic agent for a long ago. The main aim of the present investigation is to explore alternative valuble sources of herbal glycosides in selected plant in the border region of Korba and Janjgir- Champa district . Some important glycosides are listed with their mechanism of action in table 1.3

Table 1.3
Glycosides with their mechanism of action

Glycosides	Action
Cardiac glycosides	Great efficacy in numerous heart ailments, for example – congestive heart failure, arrhythmia, cardiotonic
Anthraquinone glycosides	Laxative and purgative
Flavonoids glycosides	Strengthen blood capillaries by decreasing its fragility, antioxidant
Coumerin glycosides	Dilate coronary arteries, block calcium channels antispasmodics, antibiotics, antileprotic
Phenolic glycoside	Urinary antiseptic effect
Alchoholic glycoside	Antiinflamatory, antipyretic and analgesic
Saponin glycoside	Expectorant, Antiinflamatory, diuretics, urinary tract disinfectants
Cynogenic glycosides	Sedative and hypnotic

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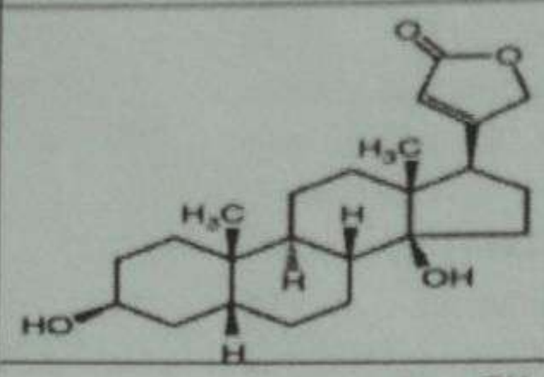
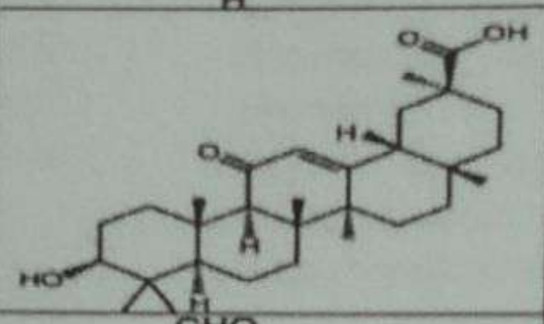
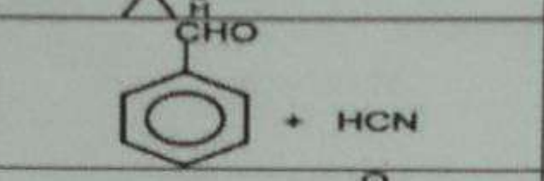
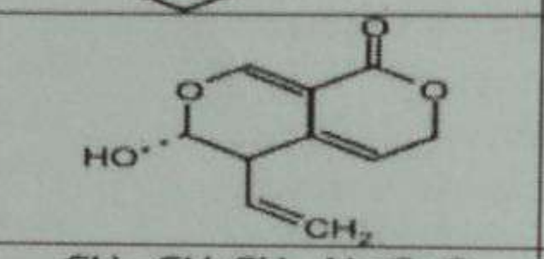
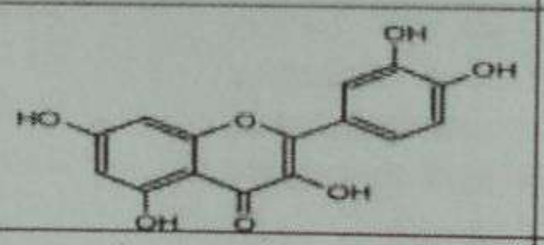
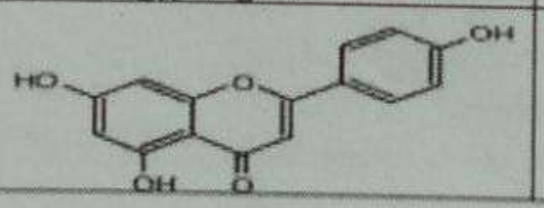
Molecular structure of glycosides

Type of glycoside	Aglycone part	Structure	Examples	Constituents
Sterol or cardiac	Digitoxigenin		Digi:alis	Digitoxin
Saponin	Glycyrrhetinic acid		Liquorice	Glycyrrhizin
Cyanogentic	Benzaldehyde and Hydrocyanic acid		Bitter Almond	Amygdalin
Bitter	Mesogentiogenin		Gen:ian	Gentiopicrin
Isothiocynate	Allylisothiocyanate	CH_2-CH-CH_2-N=C=S	Black Mustard	Sinigrin
Flavonoid	Quercetin		Ruta	Rutin
Coumarin glycoside or furano coumarine	Apigenin		Celery	Apiin

II. MATERIAL AND METHODS

Plant material

All the selected plants ware collected from Sukhari Kala Village (22° 2″N 82° 44′40″E) Kartala tehsil of Korba district chhattisgarh state India during 3rd week of October 2022. These plants were identified, authenticated and classified by Prof. Neelima Pandey, Department of Botany Govt. M.M.R.P.G.College Champa (Janjgir-Champa) Chhattisgarh, India. Description of the trees are given in the table 1.4

Table – 1.4

Description of the trees

SN	Local Name of the Trees	Hindi Name of the Trees	Botanical Name of the Trees	Family
1	Karan	Karanj	Pongamia pinnata	Fabaceae
2	Kauha	Arjuna	Terminalia arjuna	Combretaceae
3	Kasahi	Kassi	Bridelia retusa	Phyllanthaceae
4	Rohina	Indian Redwood	Soymida febrifuga	Meliaceae
5	Bhalumusar	Amaltas	Cassia fistula	Fabaceae

Washing and Drying

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The bark of collected plants were washed thoroughly 3 times in running tape water and dried in shade at room temperature for 24 days. The dried bark of each selected trees were ground well separately to a fine powder with mechanical grinder and kept in polythene lock bags until further experiment.

Preparation of extract

5 gm. of powdered bark sample of each selected trees were macerated separately in 100 ml. of water: ethanol solvent (1:1) for 48 hours with vigorously agitated many time and filtered using filter paper no.1

Preliminary phytochemical screening of bark extract of selected trees sample

Chemical tests for cardiac glycoside

(A) Keller Killiani Test

To 2mL of extract 2mL of glacial acetic acid add cone H_2SO_4 carefully, appearance of brownish-green ring at the junction of two reagents indicates the presence of cardiac glycoside (de-oxy sugar of cardenolids).

(B) 2mL of extract add 2mL pyridine and a few drops of 2% sodium nitropruside and 20% of NaOH, appearance of pink or red or deep red or brownish colour indicates the presence of cardiac glycoside.

(C) Salkowski Test

To 2mL of extract was dissolved with 2mL of chloroform and conc. H_2SO_4 Carefully added, appearance of yellow coloured ring turn to red or reddish brown at the interface, indicates the aglycone portion of the cardiac glycoside.

(D) Liebermann's Burchard's Test –To 2mL of extract, 2mL of acetic acid and conc. H_2SO_4 carefully added and cool appearance of brownish green colour indicates presence of cardiac glycoside (steroidal nucleus).

(E) Raymond's Test – To 2mL of extract, add 0.1mL of 1% m- Dinitrobenzene in ethanol and add 2-3 drop of 20% NaOH, appearance of violet colour indicates the presence of cardiac glycoside (active methelene group).

Chemical Test for flavonoid glycoside

(A) Shinoda Test-To 2mL of extract add a pinch of zinc turings and dil. HCL ,appearance of deep red colour turns to magenta colour indicate the presence of flavonoid glycoside.

(B) 2mL of extract add 2mL of dil. NaOH appearance of reddish golden colour ppt. indicates the presence of flavonoid glycoside.

(C) 2mL of extract add 2mL of 10% Lead acetate solution appearance of light yellowish green ppt. indicates the positive result of flavonoid glycoside.

Chemical Test for coumarin glycoside

(A) Fluorescence Test-2mL of extract add 1M-NaOH solution generation of blue- green fluorescence indicates presence of coumarin glycoside.

(B) 2mL of extract add few drops of alcoholic $FeCl_3$ solution appearance of dark green colour turns to yellow after some time on addition of conc. HNO_3 indicates the presence of coumarin glycoside.

Chemical Test for Anthraquinone glycoside

(A) **Borntrager's Test**-2mL of extract add 10mL of benzene filter and add 5mL of 10% ammonia solution appearance of reddish colour indicates presence of anthraquinone glycoside.

(B) **Combined anthraquinone Test**-2mL extract add dil. H_2SO_4 filtered add benzene and ammonia solution red colouration of ammonia phase indicates the anthraquinone glycoside.

Chemical Test for Saponin glycoside

(A) Foam Test -2mL of extract add 10 to 20mL of distilled water and shake well generation of foam indicates the presence of saponin glycoside.

(B) Benedicts Test-2mL of extract add 2mL of Benedict's reagent appearance of blue black ppt. indicates the presence of saponin glycoside.

Chemical Test for Cyanogenic glycoside

(A) Ferriferrocyanide Test-2mL of extract add 2mL of alcoholic KOH then transfer it to aqueous solution of $FeSO_4$ and $FeCl_3$ solution keep it on room temperature for 10 minutes then transfer the content 60-70 centigrade to 20%HCL appearance of Prussian blue colour indicates the presence of cyanogenic glycoside.

Chemical Test for Phenolic glycoside

2mL of extract add $FeCl_3$ solution drop by drop appearance of bluish black ppt. indicates the presence of phenolic glycoside.

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Table 1.5
Preliminary phytochemicals screening for herbal glycosides of bark extract of selected trees

Types of glycosides	Chemical test	Pongamia pinnata	Terminalia arjuna	Bridelia retusa	Soymida febrifuga	Cassia fistula
Cardiac glycoside	Keller Killiani Test	+	+	+	+	+
	Legal Test	-	+	+	+	+
	Salkowski Test	+	+	+	+	+
	Liebermann's Burchards Test	+	+	+	+	+
	Raymond's Test	-	-	-	-	-
Flavonoid glycosides	Shinoda Test	-	-	-	-	-
	NaOH Test		+	+	+	+
	10% Lead Acetate Test	+	+	+	+	+
Coumarin glycosides	Fluorescence Test	-	-	-	-	-
	Alcoholic $FeCl_3$ Test	-	+	+	+	+
Anthraquinone glycosides	Borntrager's Test	-	+	-	-	-
	Combined Anthraquinone Test	-	-	-	+	-
Saponin glycoside	Foam Test	+	+	+	+	+
	Benedict's Test	+	+	+	+	+
Cynogenic glycosides	Ferriferrocyanide Test	-	-	-	-	-
Phenolic glycoside	$FeCl_3$ Test	-	+	+	+	+

(+) = Present/Positive result and (-) = Absent/Negative result

III. RESULT AND DISCUSSION

Preliminary phytochemical screening of plants is important in presence or absence of certain important bioactive compounds.The detection of bioactive principles which is a new source of therapeutically and industrially valuble compound that may lead to discovery of glycoside based new and modified drugs.In the present study the presence of seven glycosides in ethanolic extract of bark of Pongamia pinnata,Teminalia arjuna,Bredelia retusa,Soymida febrifuga and Cassia fistula and results are shown in Table 1.5.

In the ethanolic extract of bark of selected trees showed the presence of cardiac glycoside,flavonoid glycoside and saponin glycosides in all selected samples.Coumarin and phenolic glycosides are present in all samples except Pongamia pinnata.Anthraquinone glycosides are present in only Terminalia arjuna and Soymida febrifuga.Wheares cynogenic glycosides are absent in all selected samples.

IV. CONCLUSION

The selected ethanomedicinal trees are source of herbal glycosides.These trees play vital role in preventing and curing various diseases.The above mentioned trees are used for discovering and screening of phytochemical constituents which are very helpful for manufacturing herbal glycoside based new drugs.Border region Janjgir-Champa and Korba district are rich in these trees source and rich sources of the hebal glycoside.This sources are required to grow and conserve for future prospect.

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