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CLIMATE CHANGES V/s PLANT DIVERSITY IN MAHDYA PRADESH

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Climate is a measure of the average pattern of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological variables in a region over long periods of time. The climate is generated by the climate system which has five components namely atmosphere, hydrosphere, cryosphere, lithosphere and biosphere. The climate is affected by its latitude, terrain and altitude along with near by water bodies and its currents. Climates can be classified according to the typical range of variables such as temperature and precipitation. The Thornthwaite system is used since 1948, incorporates evapotranspiration along with temperature and precipitation information. It is used in studying plants and animal species diversity and potential effects of climate changes. The Bergeron and Spatial Synoptic classification systems focus on the origin of air masses that define the climate of a region.

Climate is commonly defined as the weather averaged over a long

period. As defined by the World Meteorological Organization (WMO) the standard classical averaging period is 30 years, but other periods may be used depending on the purpose. Climate also includes statistics other than the average, such as the magnitudes of day-to-day or year-to-year variations. According to the Inter-governmental Panel on Climate Change (IPCC) the definition is:- *"Climate in a narrow sense is usually defined as the "average weather" or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period ranging from months to thousands or millions of years. These quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description of the climate system"*.

The difference between climate and weather is usefully summarized by the popular phrase such as "Climate is what you expect, weather is what you get." Over historical time spans there are a number of nearly constant variables

that determine climate, including latitude, altitude, proportion of land to water and proximity to oceans and mountains. These change only over periods of millions of years due to processes such as plate tectonics. Other climate determinants are more dynamic. The thermohaline circulation of the ocean leads to a 5 °C warming of the northern Atlantic Ocean compared to other ocean basins. Other ocean redistributes heat between land and water on a more regional scale. The density and type of vegetation coverage affects solar heat absorption, water retention and rainfall on a regional level.

There are several ways to classify climates into similar regimes but in Ancient Greece, climates were defined

in to describe the weather depending upon a location i.e. latitude and longitude. Modern climate classification methods can be broadly divided into *genetic* and *empiric* methods. The *genetic* classification includes methods based on the relative frequency of different air mass types or locations within synoptic weather disturbances. Whereas *empiric* classification includes climate zones defined by plant hardiness and evapo-transpiration. A common shortcoming of these classification schemes is that they produce distinct boundaries between the zones. The India Meteorological Department (IMD) designates four climatic seasons such as –

Table – 1: Climatic seasons of India

Climatic seasons	Features
Winter	It is occurring from December to March. The coldest months are December and January with an average temperature from 10 to 15°C in the northwest. Temperatures rise as one proceeds towards the equator peaking around 20 to 25°C in mainland India's southeast.
Summer or pre-monsoon	It is occurring from April to June (April to July in northwestern India). In western and southern regions, the hottest month is April but in northern regions May is the hottest month with an average temperature ranging from 32 to 40°C.
Monsoon or rainy	It is occurring from July to September. The season is dominated by the humid southwest summer monsoon. It is slowly sweeps across the country beginning in late May or early June. Monsoon rains begin to recede from north India at the beginning of October and south India typically receives more rainfall.
Post-monsoon or autumn	It is occurring from October to November. In northwestern India these months are usually cloudless.

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (decades to millions of years). It may refer to a change in average weather conditions or in the time variation of weather around longer term average conditions (more or fewer extreme weather events). It is mostly caused by the factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, volcanic eruptions and human activities.

Scientists actively work to understand past and future climate by using observations and theoretical models. A climate record extending deep into the Earth's past has been assembled and continues to be built up, based on geological evidence from borehole temperature profiles, cores removed from deep accumulations of ice, floral and faunal records, glacial and periglacial processes, stable-isotope, analyses of sediment layers and records of past sea levels.

The most common definition of climate change is a change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. The term is used to refer specifically to climate change caused by human activity,

as opposed to changes in climate that may have resulted as part of Earth's natural processes. In this sense, especially in the context of environmental policy, the term climate change has become synonymous with anthropogenic global warming. Within scientific journals, global warming refers to surface temperature increases while climate change includes global warming and everything else that increasing greenhouse gas levels affect. Scientists generally define the five components of earth's climate system to include atmosphere, hydrosphere, cryosphere, lithosphere (restricted to the surface soils, rocks, and sediments) and biosphere. Natural changes in the climate system result in internal "climate variability". Life affects climate through its role in the carbon and water cycles, such mechanisms as albedo, evapotranspiration, cloud formation and weathering. In the context of climate variation, anthropogenic factors such as human activities affect the climate.

A change in the type, distribution and coverage of vegetation may occur given a change in the climate. Some changes in climate may result in increased precipitation and warmth, resulting in improved plant growth and the subsequent sequestration of airborne CO₂. A gradual increase in warmth in a

region will lead to earlier flowering and fruiting times, driving a change in the timing of life cycles of dependent organisms. Conversely, cold will cause plant bio-cycles to lag. Larger, faster and more radical changes may result in vegetation stress, rapid plant loss and desertification in certain circumstances. Climate change devastated the tropical rainforests, abruptly fragmenting the habitat into isolated Islands and causing the extinction of many plant and animal species.

Satellite data available in recent decades indicates that global terrestrial net primary production increased by 6% from 1982 to 1999 but then decreased by 1% from 2000 to 2009. Climate change has already triggered species distribution shifts in many parts of the world and may be increasing impacts are expected for the future. Several studies have aimed for a general understanding of the regional basis for species vulnerability. It is projected in late 21st century that the distribution of 1,350 European plants species goes under seven climate change scenarios. Application of the International Union for Conservation of Nature and Natural Resources Red List Criteria shows that many European plant species could become severely threatened. More than half of the species could be vulnerable or threatened by 2080.

Expected species loss and turnover per pixel proved to be highly variable across scenarios (27-42% and 45-63%) and across regions (2.5-86% and 17-86%, averaged over scenarios).

Recent rapid climate change is already affecting a wide variety of organisms. Long term data indicate that the anomalous climate of the past half century is already affecting the physiology, distribution and phenology of several floral and faunal species in ways that are consistent with theoretical predictions. Although natural climate variation and non-climatic factors such as land transformation may be responsible for some of these trends, along with it human induced climate and atmospheric change are the most parsimonious explanation. Several studies have modeled future species distributions at regional and local scales and have extrapolated alarming extinction risks for the next century. However, few studies have considered the consequences of multiple climate-change scenarios, which represent the outcome of different assumptions about the future.

Different components of biodiversity may vary independently of each other along environmental gradients giving insights into the mechanisms that regulate species coexistence. The Functional Diversity (FD) or the

presences of rare or endemic species in natural assemblages do not necessarily increase with species diversity. If different components of plant species diversity (species richness, Simpson diversity, evenness) varied similarly to FD (measured as a generalization of the Simpson index) and rarity along grazing intensity and climatic gradients. Variation in species diversity, functional diversity and rarity are following different patterns. Species diversity is found lowest in water stressed environments and increased in humid locations. The FD is comparable between the most species poor and rich locations. The FD did not show a strong correlation with species richness nor with the Simpson Index and less specious communities show the highest functional diversity. The rarest species in the region were more frequently found in the abandoned areas with the lowest species diversity.

Consequently, the mechanisms that enhance the diversity of species do not necessarily support a functional differentiation among those species or the maintenance of rare species in a region. It was hypothesized that the degree of dependence of functional diversity on species diversity might be mostly related to the amplitude of the species traits pool and on how species partition the niche

space available. Although biodiversity can be defined using different components and species richness has been used as the main index in most studies linking biodiversity to ecosystem functioning. The underlying hypothesis of this approach is that species diversity increases the space for the functional differences among species that regulate ecosystem processes. The relationship between species and functional diversity is thus central in identifying mechanisms of biodiversity effects.

Madhya Pradesh is one of the states of India marked by a complex social structure, a predominantly agrarian economy, a difficult and inaccessible terrain and scattered settlements. According to the 2001 census, Madhya Pradesh has a population of about 60 million, which is around 6 per cent of the country population. Ranking 7th in terms of population size and 23rd in terms of population density among the states and union territories of India, it has a large and widely dispersed population with relatively low density.

The concept of agroclimatic zoning was developed by FAO (1976) which involved an ecological framework with a strong emphasis on agroclimatic parameters for delineating potential areas for agriculture. An agroclimatic zone is a land unit in terms of major climate and

the growing period which is climatically suitable for a certain range of crops and cultivars.

An ecological region is characterized by distinct ecological responses to macro climate as expressed in vegetation and reflected in soils, fauna and aquatic systems. Agriculture is highly dependent on soils and climatic condition, which in combination with other parameters decide the agroecological settings. An agroecological region is therefore, the land unit on the earth's surface carved out of agroclimatic region, when it is superimposed on land form and the kinds of soils and soil conditions that act as modifiers of climate and length of growing period. Within an ecosystem the soils are the outcome of a combined action of climate and vegetation on parent rock, as conditioned by topography over a period of time. Considering physiography, soil types, climate and length of growing period, the Country has 20 agroecological regions (NBSS & LUP, 1993). The agroecological regions as described have been modified considering the specific variability in soil types. The state has now been subdivided in 7 agroecological regions which are described below:-

1 **N & D 2:** Northern plants and central highlands including Aravallis, hot

semi-arid ecoregion with alluvium derived soils and growing period 90-150 days.

2 **I 4 C B:** Central highlands (Satpura), hot sub-humid ecoregion with shallow and medium black soils and growing period 150-180 days.

3 **I 5 D 2:** Central highlands (Malva), hot sub-humid ecoregion with medium and deep black soils and growing period 90-150 days.

4 **I 5 C 3:** Central highlands (Malva, Vindhyan plateau), hot sub-humid ecoregion with medium and deep black soils and growing period 150-180 days.

5 **I 6 C 3/4:** Central highlands (Bundelkhand, Satpura), hot sub-humid ecoregion with black and red soils and growing period 150-180 & up to 210) days.

6 **J 3 C 3:** Eastern plateau (Chhatisgarh), hot sub-humid ecoregion with red and yellow soils and growing period 150-180 days.

7 **J 2 C 3/4:** Eastern plateau, hot sub-humid ecoregion with red and lateritic soils and growing period 150-180 & up to 210) days.

State has a subtropical climate. Like most of north India it has a hot dry summer (April-June) followed by monsoon rains (July-September) and a cool and relatively dry winter. The

average rainfall is about 1,370 mm (53.9 in). It decreases from east to west. The south-eastern districts have the heaviest rainfall, some places receiving as much as 2,150 mm (84.6 in), while the western and north-western districts receive 1,000 mm (39.4 in) or less. State is divided into following agro-climatic zones:

1. Chattisgarh Plain Balaghat
2. Northern Hill Region of Chattisgarh
3. Kymore Plateau Satpura Hills
4. Central Narmada Valley
5. Vindhya Plateau
6. Grid (Hills Gwalion) Region
7. Bundelkhand
8. Satpura Plateau (Hills)
9. Malwa Plateau
10. Nimar Plains
11. Jhabua Hills

Further, the national Agricultural Research Project (NARP), based on rainfall existing cropping pattern and administrative units divided the whole country into 129 sub zones, out of which 12 sub zones are in Madhya Pradesh. These sub zones hereafter referred as agroclimatic zones are as detailed in Table – 2.

Climate change provides challenges around both the rural and urban fronts for development in the state. The state is marked with a complex social structure, a predominantly agrarian economy, a difficult and inaccessible terrain and scattered settlements over a vast area that together pose several formidable problems to service delivery systems. Many areas in the State are vulnerable with considerable poverty. The State is already needs to scale up its anti-poverty measures. Climate change has the potential to undermine existing efforts to tackle the mountain of poverty removal in the state and the complex social development problems faced. Drought, lack of investment to produce year round cropping, a degrading forest resource are all problems that will be exacerbated by climate change and make the problem of delivering more and better livelihoods more difficult. There are opportunities to link up with the Government of India (GoI) National Action Plan on Climate Change (NAPCC) policy missions on enhanced energy efficiency; sustainable habitat; conserving water and a Green India. Article-1 of the United Nations Convention to Combat Desertification (UNCCS) defines land degradation as a “reduction or loss” in arid, semi-arid and dry sub-humid areas of the biological or

Table – 2: The basic characteristic of Agroclimatic zones of the State

S.No.	Zone with districts	Argo-ecological region	Area (m %)	Physiography	Soil	Climate	Rain-fall (mm)	PET (mm)	Water deficit (mm)	Growth period (days)	Major crops	Forest type
1.	Bundelkhand (Datia, Tikangarh, Chhatarpur and 1/2 E) Shivpuri	16C3 & N8D 2	4.67%	Central high lands	Mixed red and black soils with low humid and medium AWC	Hot sub-humid	1000 to 1500	1300 to 1500	500 to 700	150 to 180 (210)	Wheat, gram, jowar, urid, sesamum etc.	Tropical moist deciduous
2.	Central Narmada Valley (Narsinghpur and Hoshangabad)	15C3	3.40%	Central high lands	Deep, clayey, black soils with high AWC	Hot sub-humid	1000 to 1500	1300 to 1500	500 to 700	150 to 180 (210)	Soybean, wheat, gram, arhar, paddy, etc.	Tropical moist deciduous
3.	Chhatisgarh plains-Balaghat	J3C3	17.55%	Eastern plateau	Medium & deep, loamy, red and yellow soils with medium AWC.	Hot sub-humid	1200 to 1600	1400 to 1500	500 to 700	150 to 180	Paddy, teora, kodo-kutki, gram, linseed. Etc.	Tropical moist deciduous

4.	Gird (Morena, Bhind, Gwalior, ½ W Shivpuri and Guna)	N8D 2	8.46%	Central high lands	Deep, loamy, alluvium derived soils with medium AWC and shallow to medium sandy to loamy, grey brown soils	Hot semi-arid	500 to 800	1400 to 1900	700 to 1000	90 to 150	Wheat, mustard, gram, jowar, bajra etc.	Tropical moist deciduous
5	Jhabua hills (Jhabua)	15D 2	1.51%	Central high lands	Medium & deep, fine loamy and clayey black soils with medium	Hot semi-arid	500 to 1000	1600 to 2000	800 to 1200	90 to 150	Maize, urid, gram, wheat, jowar etc.	Tropical moist deciduous
6.	Kymore plateau & Satpura hills (Jabalpur, Satna, Panna, Seoni, Rewa and Sidhi)	16C3 /4 & I5C3	11.27%	Central high lands	Medium & deep, clayey, black soils with medium & high AWC & clayey red soils with low AWC	Hot sub-humid	1000 to 1500	1300 to 1500	500 to 700	150 to 180 (210)	Wheat, paddy, gram, kodo-kutki, soybean, etc.	Tropical moist deciduous

7	Malwa plateau (Ujjain, Mandasaur, Ratlam, Shajapur, Indore, Rajgarh, Dewas and Dhar)	15D 2 & 15C3	11.68%	Central high lands	Medium & deep, fine loamy and clayey black soils with medium & high AWC	Hot semi-arid	500 to 1000	1600 to 2000	800 to 1200	90 to 150	Soyabean, gram, jowar, wheat, maize, etc.	Tropical moist deciduous
8	Nimar valley (Khargone and Khandwa)	15D 2	5.56%	Central high lands	Medium & deep, fine loamy and clayey black soils with medium & high AWC	Hot semi-arid	500 to 1000	1600 to 2000	800 to 1200	90 to 150	Cotton, jowar, wheat, urid, ground-nut etc.	Tropical moist deciduous
9	Northern hills zone of Chhattisgarh (Shahdol, Surguja, Mandla and 1/2N) Raigarh	J3C3	12.54%	Eastern plateau	Medium and deep, loamy, red & yellow soil with medium AWC.	Hot sub-humid	1200 to 1600	1400 to 1500	500 to 700	150 to 180	Paddy, kodo-kutki, wheat maize, niger, etc.	Tropical moist deciduous
10	Satpura plateau (Betul and Chhindwara)	14C3	4.94%	Central high lands	Shallow & medium clayey black soil with low to	Hot sub-humid	1000 to 1500	1300 to 1500	500 to 700	150 to 180 (210)	Soybean, jowar, wheat, kodo-kutki,	Tropical moist deciduous

					medium AWC						maize etc.	
11	Vindhyan plateau (Sagar, Damoh, Bhopal, Sehore, Raisen and Vidisha)	15C3	9.61%	Central high lands	Medium & deep, clavey, black soils with medium & high AWC	Hot sub- humid	1000 to 1500	1300 to 1500	500 to 700	150 to 180 (210)	Wheat, soybean, gram, masoor, jowar, etc.	Tropical moist deciduous

economic productivity and complexity of rain-fed cropland, irrigated cropland or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes. It includes processes arising from human activities and habitation patterns, such as:-

- *soil erosion caused by wind and/or water,*
- *deterioration of the physical, chemical and biological or economic properties of soil,*
- *long term loss of natural vegetation*

Desertification is a subset of land degradation under dry climates (arid, semi-arid and dry sub-humid areas). The latest estimates indicate that 12 Mha of land is transformed into new man-made deserts every year (UNCCD, 2011) and that one quarter of the world's agricultural land is highly degraded some irreversibly (FAO, 2011). Natural and anthropogenic factors are the driving forces of desertification. Causes of desertification can be divided into two categories: direct and indirect.

- *Direct causes:* - *Its include climate and human activities like overgrazing, over-exploitation, deforestation and inappropriate use of irrigation technology.*
- *Indirect causes:* - *Its include population pressure, urbanization,*

poverty and inequitable sharing of resources.

Desertification affects about one-sixth of the world's population. About 70% of all dry lands (3-6 billion ha) and one quarter of the total land area of the world and an estimated annual direct financial losses amount to more than US \$42 billion. It causes not only deterioration of the environment and productivity of the fragile ecosystems, but also increases poverty among people living in the regions.

Land degradation is another factor influencing land loss, flora and fauna vulnerability. It is temporary or permanent lowering of productivity through deterioration of the land's physical, chemical and biological conditions. Land degradation is a reduction in the capacity of land to perform ecosystem functions and services that support society and development. Principal processes of land degradation include:-

- *Wind,*
- *Water,*
- *Erosion,*
- *Chemical degradation* (acidification, salinization and leaching),
- *Physical degradation* (crusting, compaction and, hard-setting)

Land degradation is happen by a single process or a combination of

processes. The forces and pressures governing these processes may be *biophysical* or *socio-political* which is reflected as:-

- *Unsustainable utilization or over exploitation of natural resources,*
- *Land,*
- *Water,*
- *Forests,*
- *Minerals,* etc.

Major causes of land degradation are:-

- *Deforestation,*
- *Intensive agriculture,*
- *Encroachments,*
- *Land use changes,*
- *Over-exploitation of natural resources.*

In Madhya Pradesh the major causing factors of land degradation are reported as:-

Table – 3: factors of land degradation In Madhya Pradesh

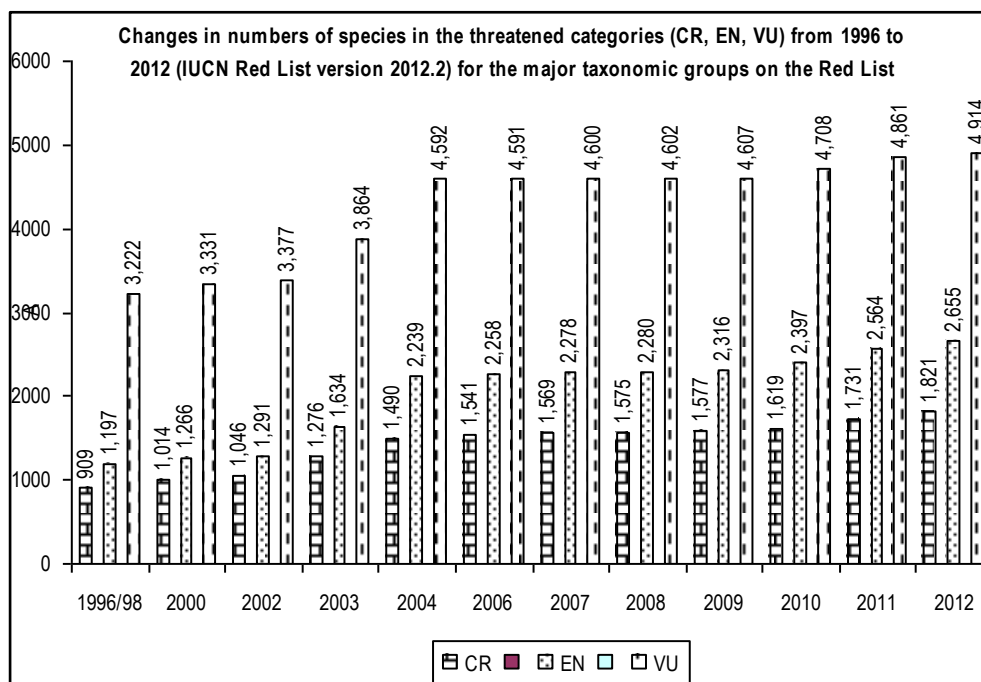
Land Degradation Factor	Value (Lakh ha.)
Water & Wind	139.64
Water Logging	0.01
Alkali / Sodic	1.26
Acidic Soil	4.82
Saline Soil	0.00
Mining & Industry	0.29
Total	140.95

Sustainable land and ecosystem management and adaptation of best management practices seem to be the logical solution to address these issues (MoEF, 2012).

Changes in numbers of species in the threatened categories (CR, EN, VU) from 1996 to 2012 (IUCN Red List version 2012.2) for the major taxonomic groups on the Red List is estimated and projected below in (**Fig. – 1**). The changes in species number from year to

year should not be directly interpreted as trends in the status of biodiversity. The figures displayed below reflect increased assessment efforts by IUCN and its Partners over time, rather than genuine changes in numbers of threatened species. These figures really indicated that the development, anthropological activities, land degradation, desertification, deforestation, mining, ground water loss, unsustainable management of nature and natural

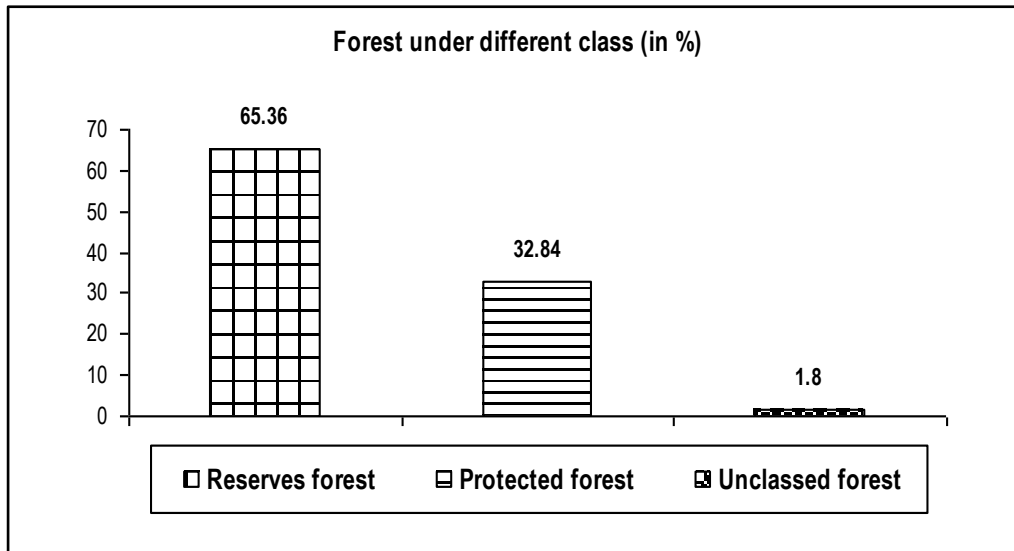
resources causes to uncertainty and changes. uncontrolled natural disasters and climate



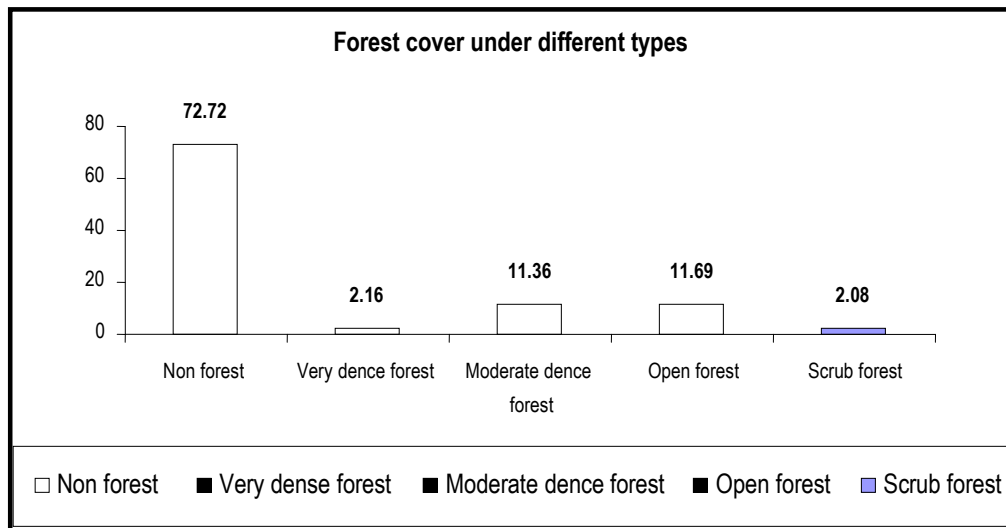
Studies on state-level emissions are limited. One of these studies revealed that there is considerable inter-state variation in CO₂ emissions. State level CO₂ emissions figures for 2000 indicate that Uttar Pradesh has the highest level of pollution followed by Madhya Pradesh, Maharashtra, Andhra Pradesh, West Bengal, Gujarat and Tamil Nadu. In per capita emission terms, Madhya Pradesh has the highest emissions at 660 metric tones Ghoshal and Bhattacharya (2007). In terms of per capita emissions, Madhya

Pradesh had aggregated emissions of 39,729.4 tons and per capita emissions of 0.66

The forest and environmental resources in the state are also under continual pressure and severe pollution of rivers, wetlands, degradation of forests and biodiversity loss has been reported. The state is having 308245 km² geographical areas and the forest comprises 77700 km². Out of total forested area Reserved, Protected and Un-classed forest are recorded as 65.36%, 32.84% and 1.8% (Fig. – 2).



Detail of forest cover under different types such as Very dense forest, Moderate dense forest, Open forest and Scrub forest are represents 2.16%, 11.36%, 11.69% and 2.08% respectively. (Fig. – 3).



On other hand the state has diversified floral elements under defined and classified reserved and protected forest (Teak, Sal and Mixed vegetation) areas and 11 agro-climatic zones.. In

totality, the state has a systematic profile of 2,751 species belonging to 164 families and 1,201 genera. Beside it, various authors have contributed several contributory studies such as addition to

flora, family, genera and species at enhance floral element diversity.
district, regional and state levels to

Table – 4: Systematic account of floral element diversity of the state

Workers	Identified floral elements		
	Family	Genera	Species
Verma <i>et. al.</i> , 1993	83	407	874
Mudgal <i>et.al.</i> , 1997	51	320	792
Singh <i>et. al.</i> 2001	37	241	706
Khanna <i>et. al.</i> , 2001	7	233	379

According to “Red Data Book” (Nayar & Sastry, 1990) a total of 41 plant species have been identified under R = Rare, T = Threatened, CR = Critical and E = Endemic categories. The botanical name, family name and threat status of these species is atbulated below in Table – 5.

Table – 5: Plant species identifies in “Red Data Book” (Nayar & Sastry, 1990)

S. No.	Name of the plant	Family	Status
1.	<i>Acacia donaldi</i> Haines	Mimosaceae	R, T
2.	<i>Allium stracheyi</i> Baker	Alliaceae	V
3.	<i>Alsophila balakrishnanii</i> (R.D.Dixit & Tripathi) R.D.Dixit	Cyatheaceae	CR
4.	<i>Alstonia venenata</i> R. Br.	Apocynaceae	R, T
5.	<i>Alysicarpus vasavadae</i> Hemadri	Fabaceae	E
6.	<i>Amorphophallus sylvaticus</i> (Roxb.) Kunth	Araceae	R, T
7.	<i>Andropogon grahamii</i> Haines	Poaceae	E
8.	<i>Andropogon pumilus</i> Roxb.	Poaceae	R, T
9.	<i>Aspidopterys cordata</i> (B. Heyne ex Wall.) A. Juss.	Malpighiaceae	R, T
10.	<i>Berberis hainesii</i> Ahrendt	Berberidaceae	E
11.	<i>Bupleurum plantaginifolium</i> Wight	Apiaceae	R, T
12.	<i>Calpurnia aurea</i> (Aiton) Benth.	Fabaceae	R, T

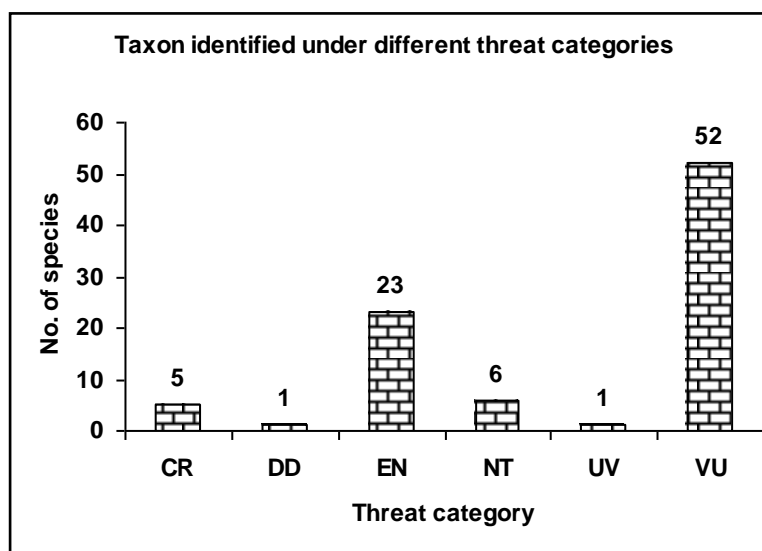
13.	<i>Cleome felina</i> L.f.	Cleomaceae	R, T
14.	<i>Crotalaria notonii</i> Wight & Arn.	Fabaceae	R, T
15.	<i>Crotalaria vestita</i> Baker	Fabaceae	R, T
16.	<i>Curcuma sulcata</i> Haines	Zingiberaceae	E
17.	<i>Desmodium rotundifolium</i> (Michx.) DC.	Fabaceae	R, T
18.	<i>Eragrostiella leioptera</i> (Stapf) Bor	Poaceae	R, T
19.	<i>Eulophia mackinnonii</i> Duthie	Orchidaceae	R
20.	<i>Euphorbia caducifolia</i> Haines	Euphorbiaceae	E
21.	<i>Ficus cupulata</i> Haines	Moraceae	E
22.	<i>Ficus cupulata</i> Haines	Moraceae	CR
23.	<i>Flemingia grahamiana</i> Wight & Arn.	Fabaceae	R, T
24.	<i>Grewia hainesiana</i> Hole	Tiliaceae	E
25.	<i>Hibiscus pachmarhicus</i> Haines	Malvaceae	E
26.	<i>Hypericum gaittii</i> Haines	Hypericaceae	R, T
27.	<i>Jasminum brevipetiolatum</i> Duthie ex Brandis	Oleaceae	CR
28.	<i>Lindsaea malabarica</i> (Bedd.) Bak. ex Christ.	Lindsaeaceae	R
29.	<i>Maytenus bailadillana</i> (V. Naray. & Mooney) D.C.S. Raju & Babu	Celastraceae	E
30.	<i>Maytenus rothiana</i> (Walp.) Ramamoothy	Celastraceae	R, T
31.	<i>Melhania hamiltoniana</i> Wall.	Malvaceae	R, T
32.	<i>Nogra dalzellii</i> (Baker) Merr.	Fabaceae	R, T
33.	<i>Nogra filicaulis</i> (Kurz) Merr.	Fabaceae	E
34.	<i>Nogra filicaulis</i> (Kurz) Merr.	Fabaceae	R, T
35.	<i>Oropetium villosulum</i> Stapf ex Bor	Poaceae	R, T
36.	<i>Polygonum myriophyllum</i> H. Gross	Polygonaceae	E
37.	<i>Saussurea bracteata</i> Decne.	Asteraceae	R
38.	<i>Senecio corymbosus</i> Wall.	Asteraceae	R, T
39.	<i>Smithia pycnantha</i> Baker	Fabaceae	R, T

40.	<i>Theriophonum minutum</i> (Willd.) Baill.	Araceae	R, T
41.	<i>Utricularia baoulensis</i> A. Chev.)	Utriculariaceae	R, T

Threat Assessment and Management Prioritization (TEMP) Ved, et.al 2003 & 2006) workshop for medicinal plants of central Indian states formed an initial step to conservation and sustainable use of medicinal plants under a Global Environment Facility (GEF) supported program. After the four day rapid exercise a total of 40 species were identified for the state of M. P. under threat categories CR (3), EN (6) and VU (31). Another workshop was organized by the Madhya Pradesh State Biodiversity Board, Bhopal in collaboration with FRLHT, Bangalore for

Madhya Pradesh (an eco-regional assimilation for conservation action) at Bhopal and a total of 48 species belonging to 45 genera and 32 families have been identified under threat categories CR (2), EN (17), VU (22), NT (6) and DD (1) respectively.

In all total 88 (3.2%) of state floral elements known (2751 species) have been selected and identified till to date under various threat categories namely Critical (RC), Endangered (EN), Vulnerable (VN), Near Threatened (NT) and Data Deficient (DD) (**Fig. – 4**) for the state.



The name of RET species recognized under different threat categories are given below :-

THREAT STATUS - VULNERABLE

Acampa praemorsa (Roxb.) Bl. & McCann., *Amorphophallus paeoniifolus* (Denn) Nicol, *Andrographis peniculata* (Burm. F) Wall., *Aristolochia bracteolata* Lam., *Bacopa monnieri* (L) Wettst., *Barleria prionitis* L., *Boswellia serrata* Roxb., *Butea parviflora* Roxb., *Carea arborea* Roxb., *Celastrus peniculatus* Wild., *Centella asiatica* (L) Urban., *Ceropegia bulbosa* Roxb., *Chlorophytum tuberosum* Baker., *Citrullus colocynthis* Schrad., *Cochlospermum religiosum* (L) Alston, *Costus speciosus* L., *Crateva magna* (Lour.) DC., *Cryptolepis buchanani*, Roem. & Schult., *Curcuma angustifolia* Roxb., *Curcuma aromatica* Salisb., *Curcuma zedoaria* (Christ) Roscoe, *Dichrostachys cinerea* (L) W. & A., *Dillenia pentagyna* Roxb., *Dioscoria bulbifera* L., *Dioscoria hispida* L., *Drosera burmanni* vahl., *Embelia tesjeriam-cotton*, *Gloriosa superba* L., *Gmelina arborea* Roxb., *Gymnema sylvestre* R.Br., *Hardwickia binata* Roxb., *Litsea glutinosa* (Lour) C. B. Robins, *Marsdenia tenacissima* (Roxb.) Monn., *Moringa concanensis* Nimmo, *Orozyllum indicum* L., *Peucedanum nagpurensis* (Clarke) Prain, *Phyllanthus emblica* Gaertn, *Plumbago zaylanica* L., *Pterocarpus marsupium* Roxb., *Pygmaeopreumna herbacea* (Roxb.) Moldenke, *Rauwolfia serpentina* (L)

Benth. ex. Kurz, *Rubia cordifolia* L., *Salvadora oleoides* ,Decne, *Soyimida febrifuga* (Roxb) A. Juss., *Sterculia urens* Roxb., *Symplocos racemosa* Roxb., *Terminalia chebula* Retz., *Thalictrum foliolosum* DC., *Tylophora indica* (Burm.f.) Merr., *Uraria picta* (Jacq) Desv.ex.DC, *Urginea indica* (Roxb.) Kunth.and *Zeuxine strateumatica* (L) Schlechter

2. THREAT STATUS - UNDER VENERABLE

Capparis deciduas (Forsk) Edgew.

3. THREAT STATUS - NEAR THREATENED

Bauhinia vahlii W. & A., *Butea superva* Roxb. ex Willd., *Cullen corylifolia* (L) Medik., *Tacca leontopetaloides* (L) Kuntze, *Trichosanthes cucumerina* L. amd *Urginea indica* (Roxb.) Kunth.

4. THREAT STATUS - ENDANGERED

Acorus calamus L, *Angiopteris evecta* (Forst) Hoffm, *Berberis hainesii* Ahrenst. var. *brevifilipes* Ahrendt, *Ceropegia hirsute* W. & A., *Chlorophytum borivillianum* Santapau & Rernan., *Clerodendrum serratum* (L) Moon, *Corallocarpus epigaeus* (Rott.) C.B., *Didymocarpus pygmaea* C.B.Clark, *Drosera indica* L., *Entada rheedei* Spreng., *Equisetum ramosissimum* Desf., *Eulophia herbacea* Lindl., *Gardenia gummifera* L., *Hedychium coronarium* J.

Koenig, Luffa echinata Roxb., Musa rosacea Jacq., Nervilia aragoana Gaud, Nervilia plicata (Andr.) Schlechter, Palhingaea cernua (L) Franco. & Vasc., Peuraria tuberosa (Roxb. ex Willd.) DC., Prosopis cineraria (L) Druce., Sarcostemma acidum (Roxb) Voigt and Schleichera oleosa (Lour) Oken.

5. THREAT STATUS - DATA DEFICIENT

Ficus tinctoria G. Fost. subsp. parasitica (Willd) Corner

6. THREAT STATUS - CRITICAL

Alectra chittrakutensis (Rau) Prasad & Dixit, Commiphora wightii (Arn) Bhandari, Grewia asiatica L., Osmunda regalis L. and Psilotum nudum (L) P, Beauuv (Shukla, et. al. (2007, 2007a & 2009: Masih, (2007), Tiwari, Masih & Shrivastava (2007) and Nayar & Sastry (1990).

Beside it several plant species are also unknown till date which are coming under vulnerability limit and going to be rare, endangers and threatened categories and some of them vanished from their suitable habitats.

According to an assessment of loss of forest area revealed and estimated on the basis of ISFR, 2009 & 2013 the changes recorded as -7 km², -21 km², 28 km² and -5 km² in Very dance forest, Moderate dense forest, Open forest and Scrub forest cover respectively. This

observation seriously indicating that the climatic changes are taking place at the fast rate and impacted not in the forest areas but also in the non forest areas including agriculture areas. The unwanted cold, cloud, heavy rain, temperature fluctuation, etc are due to the weather shifting and climate change. Present paper is focusing on the climate change and its impact and loss of floral and faunal diversity not in natural forest areas but also in non forest areas.

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BIODIVERSITY OF GRASS FLORA FOUND IN COLLEGE CAMPUS, DURG DISTRICT, C.G.

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ABSTRACT

Durg is a major city in Chhattisgarh state, the city is an agricultural market and heavily engaged in milling rice and pigeon peas. Durg gained importance as an industrial centre after the establishment of a large steel plant at Bhilai. It is the headquarters of Durg District, the third largest district of Chhattisgarh. Durg generally has a dry tropical weather which is moderate but on a warmer side in summer season. The peak temperatures are usually reached in May/June and can be as high as 45⁰C. The onset of monsoon is usually from July and the season extends up to September, with monsoon peaking during July and August.

Present study is based on the study of biodiversity of grass flora in campus of Govt. Arts and Science College Durg, Chhattisgarh. Campus is home of different grass species belonging to Family Poaceae. Several cyperaceae family species such as *Cyperus elusoides*, *Cyperus kyllinga* and *Cyperus flavidus* are being conserved on the campus, and they exhibit a high degree of regeneration potential. This study was undertaken to understand that how academic institutions could play a significant role in conserving biodiversity and this study is one of the preliminary efforts in this endeavor.

In this regard academic institutions could play a very significant role in conserving biodiversity with minimal effort which might support other institutions concerned with conservation and management of biodiversity.

Key Words: Grass, flora, Durg, Poaceae , Cyperaceae

INTRODUCTION

Biodiversity is nature's greatest gift to humanity. Year, 2010, has been declared as the International Year of Biodiversity (IYB) by the United Nations. Biodiversity relates to the

variety of life forms essential for sustaining the natural living systems or ecosystems that provide us with food, fuel, health, wealth and other vital services. Humans are part of this

biodiversity too with the potential to protect or destroy it. There are approximately 3,00,000 plant species on the planet earth comprising flowering plants (87 per cent), non-flowering plants (0.32 per cent), ferns (4.4 per cent), mosses (5 per cent) and red and green algae (3.3 per cent) (World Conservation Union, IUCN online). As per a report, around 22 to 47 per cent of the world's plant species come under the endangered category (Graham, 2002). Biodiversity is not uniformly distributed on the earth it increases from the poles to the equator, and from high elevations to low elevations. Diversity is greater on continents than on islands, and rather low in habitats with extreme environmental conditions such as deserts, hot springs, etc. India has a rich tradition of conservation, and with growing inputs from the Government, scientists and NGOs, should provide leadership in developing appropriate methodologies and strategies for biodiversity assessment and conservation.

Current estimates put 13 per cent of global flora on the verge of extinction (Hotspot Science online). Although the total number of plant species worldwide remains unknown (estimates range from 3,10,000 to 4,22,000 species), calculations show that between 94,000 and 1,44,000 species are at the risk of

dying out (Graham, 2002). Several studies indicate mass extinction of valuable species, as we have roughly altered half of the habitable surface of the earth besides impairing and destroying several ecosystems. However, some of the ecologically sensitive landscapes rich in bio-diversity and known as hotspots cover less than 2.5 per cent of the earth's surface. Two such landscapes located in India, viz., the Western Ghats and the Himalayas are responsible for India being recognized as one of the mega biodiversity countries of the world. These two biodiversity hotspots are home to nearly 16,000 plant species with the Western Ghats having 38 per cent and the Himalayas 62 per cent. About 2.1 per cent of the global plant species is endemic in these two hotspots (Conservation International, Hotspot Science).

The study on plant bio-diversity on college campus of Durg reveals that grasses could play a significant role in the conservation of biodiversity has provided a favourable micro-climate environment for conservation and regeneration of many other plant important species. Thus, this study supports the view that grasses could play a very significant role in conserving biodiversity with minimal effort which might support other institutions, such as

Forest Department, in their rehabilitation programmes.

METHODOLOGY

Extensive field survey was undertaken during the year 2013-14. The sampling sites were selected randomly covering all over the area. The site was periodically visited to collect the grasses. The grasses were freshly collected and

their digital photographs were taken and identified with the help of available literature and experts of subject.

RESULTS AND DISCUSSIONS

The study revealed the occurrence of 36 grass species belonging to Poaceae and Cyperaceae families were recorded (Table 1).

Table 1: List of Grass Species Occurring in study area

S.No.	Botanical Name of Plant Species	Family
1.	<i>Isachne miliacea</i>	Poaceae
2.	<i>Panicum montanum</i>	Poaceae
3.	<i>Paspalum scrobiculatum-</i>	Poaceae
4.	<i>Eragrostis aspera</i>	Poaceae
5.	<i>Eragrostis viscosa</i>	Poaceae
6.	<i>Eragrostis pilosa</i>	Poaceae
7.	<i>Eragrostis nigra</i>	Poaceae
8.	<i>Eragrostis gangetica</i>	Poaceae
9.	<i>Setaria palida</i>	Poaceae
10.	<i>Eleusine aegyptiaca</i>	Poaceae
11.	<i>Aristida depressa</i>	Poaceae
12.	<i>Pennisetum cenchroides</i>	Poaceae
13.	<i>Eragrostis diarrhena</i>	Poaceae
14.	<i>Cymbopogan citratus</i>	Poaceae
15.	<i>Cynodan dactylon</i>	Poaceae
16.	<i>Fimbristylis schoenoides</i>	Poaceae
17.	<i>Panicum fluitans</i>	Poaceae

18.	<i>Dichanthium annulatum</i>	Poaceae
19.	<i>Heteropogon contortus</i>	Poaceae
20.	<i>Sacciolepis Interrupta</i>	Poaceae
21.	<i>Aplada mutica</i>	Poaceae
22.	<i>Brachiaria ramosa</i>	Poaceae
23.	<i>Setaria glauca</i>	Poaceae
24.	<i>Cenchrus setigerus</i>	Poaceae
25.	<i>Melanocentris royleana</i>	Poaceae
26.	<i>Paspalidium Flavidum</i>	Poaceae
27.	<i>Echinochloa colonum</i>	Poaceae
28.	<i>Digitaria adsendens</i>	Poaceae
29.	<i>Paspalum sangrinale</i>	Poaceae
30.	<i>Oryza sativa</i>	Poaceae
31.	<i>Setaria tomentosa</i>	Poaceae
32.	<i>Cyperus elusinooides</i>	Cyperaceae
33.	<i>Cyperus kyllinga</i>	Cyperaceae
34.	<i>Cyperus hyalinus</i>	Cyperaceae
35.	<i>Cyperus globosus</i>	Cyperaceae
36.	<i>Cyperus flavidus</i>	Cyperaceae

CONCLUSION

According to the result we can say that the grass flora of Govt. Arts and Science College Durg, Chhattisgarh, shows a satisfactory biodiversity ranges distribution and abundance pathways which makes a natural plants succession

ACKNOWLEDGEMENT

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SEASONAL VARIATION IN DISEASES OF MEDICINAL PLANT -

TINOSPORA CORDIFOLIA (GILOY)

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ABSTRACT

Medicinally important plants are facing serious problems of the fungal attack. Various pathogens adversely affect the medicinal plant parts and decrease their medicinal values. It may be harmful to the human body if these infected parts are used as medicines. So identification of the infected fungi is very important.

Therefore, for maximum yield of quality products of medicinal plants, there is a need to collect sufficient data for having understanding of biological, economical, social and environmental processes which can provide the basis for integrated management of diseases occurring in these plants. *Tinospora* or Giloy or Amrita is a well known medicinal herb contains anti-inflammatory and antipyretic properties. This herb has been used in Ayurveda in India since centuries as a medicine in building up the immune system and the body's confrontation against definite infecting organisms. This paper deals with the taxonomic description of *Cercospora* sp, *Alternaria alternata* and *Curvularia lunata*. They cause leaf spot diseases on *Tinospora cordifolia*

Key Words- *Tinospora*, giloy, fungus, disease, symptoms, conidia, conidiophores etc.

INTRODUCTION

Tinospora cordifolia (Giloy)- is a big climber (glabrous) shrub generally climbs on large trees. It is a twining, succulent-stemmed, fast growing with tuberous roots. Its branches are grey-green, up to 40 mm in diameter, becoming brown with age. Disease survey was conducted in medicinal plant nursery of the Institute and JNKVV. *Tinospora* is very helpful in building up

natural protection against various diseases. It is often used to fight against general debility, dyspepsia, and some other gastrointestinal diseases. This herbal medication is stomachic and diuretic in nature which effectively stimulates the secretion of bile juice, relieves thirst, burning sensation, vomiting tendencies, and jaundice. It is well known medicinal herb contains anti-

inflammatory and antipyretic properties. Tinospora or Giloy is used as an immune-modulator in immune-suppression of certain ailments like as obstructive jaundice, hepatic fibrosis, peritonitis and sepsis. Guduchi or Giloy improve the functioning of protective cells, macrophages and will improve body's resistance to infections. Tinospora is a big climber (glabrous) shrub generally climbs on large trees. It is a twining, succulent-stemmed, fast growing with tuberous roots. Its branches are grey-green, up to 40 mm in diameter, becoming brown with age. The leaves are heart-shaped. Its flowers are tiny creamy-greenish. It flowers in spring. These ripen during summer and autumn. Its stems are fleshy and roots are long thread like, aerial, arise from branches. Bark is thin, grayish or creamy white in color, When peeled fleshy stem is exposed. The plants are long-lived and often locally abundant. It does not require any particular type of soil. It can grow in any temperature.

Tinospora is very helpful in building up natural protection against various diseases. It is often used to fight against general debility, dyspepsia, and some other gastrointestinal diseases. This herbal medication is stomachic and diuretic in nature which effectively stimulates the secretion of bile juice,

relieves thirst, burning sensation, vomiting tendencies, and jaundice.

Medicinally important plants are facing serious problems of the fungal attack various pathogens adversely affect the medicinal plant parts and decrease their medicinal values. It may be harmful to the human body if these infected parts as used as medicines. So identification of the infected fungi is very important.

METHODOLOGY

Isolation of fungal flora-

Diseased parts of Giloy were collected from medicinal plant nursery of the Institute and nursery of JNKVV. Samples were collected in three different season i.e. summer, monsoon and winter. In order to record the fungal flora associated with giloy plant, Isolation methods as recommended by Agarwal & Hasija, 1986 were followed. Tissues from the diseased portion of the plant cut into about 1 mm piece with the help of sterilized blade and forceps and surface sterilized for 5 minutes in a solution of 0.5% sodium hypochloride in sterile water and under aseptic condition transferred into the Petridishes containing pre sterilized PDA medium supplemented with rose bengol and streptopenicillin. The Petri-dishes were incubated at $28\pm 2^{\circ}\text{C}$ temp. In low temperature incubator, examined regularly and as soon as growth appears

transferred into slants containing PDA medium.

RESULT AND DISCUSSION

A brief taxonomic description of various diseases, micro organisms recovered during the survey, i.e. *Cercospora sp.*, *Alternaria alternata* and *Curvularia lunata* these pathogens causing leaf spot disease in giloy plant, symptoms caused by them in natural and in laboratory conditions is given below-

1. *Cercospora sp*

Symptoms of disease- Brownish necrotic, irregular spots appear on the leaf surface. Spots enlarge, extend and join together leaving characteristic 'shot hole'. Leaves become yellow and wither off as disease becomes severe. Disease was found in all three seasons. It is more prevalent during monsoon followed by winter

Factors responsible for spreading of the disease

- The disease is air borne dispersing by uredospores through water droplets and wind current.
- Temperature of 30-35⁰ C and high relative humidity above 80% are favorable for diseases development

Colony characteristics- *Cercospora sp* -

Colonies on PDA medium at 28±2⁰c colonies effuse, grayish tufted. Mycelium mostly immersed. Stroma often present but not large, setae and

hyphopodia absent. Conidiophores macronematous, mononematous, caespitose, straight or flexuous sometimes gemiculate, unbranched or rarely branched. Conidiophores dark, simple arising in clusters and bursting out of leaf tissue bearing conidia successively on new growing tips. Commonly causing leaf spot.

2. *Alternaria alternata*.

Symptoms- Brownish necrotic, irregular spots appear on the leaf surface. Leaves become yellow and wither off as diseases become severe. Disease was found in all three seasons. It is more prevalent during winter followed by monsoon.

Factors responsible for spreading of the disease -

- The disease is air borne dispersing by conidia through water droplets and wind current.
- Temperature of 12-15⁰ C and relative humidity of 45-60 % are favourable for the outbreak of diseases development

Colony characteristics-

Alternaria alternata

Colonies on PDA medium at 28±2⁰c colonies effuse, usually grey, dark blackish-brown or black. Mycelium all immersed or partly superficial; hyphae colorless, olivaceous brown or brown. Stroma rarely formed. Conidiophores dark, simple, rather short or elongate, typically bearing a simple or branched

chain of conidia. Conidia dark typically with both cross and longitudinal septa; variously shaped, conidiogenous cells integrated, terminal becoming intercalary, polytretic sympodial or sometimes monotretic, cicatrized. Parasitic or saprophytic on plant material. Colonies usually black or olivaceous black, sometimes grey. Conidiophore arising singly in small groups, simple or branched, straight or flexuous, sometimes geniculate, pale to mid olivaceous or golden brown, smooth.

3. Curvularia lunata

Symptoms- Initially circular pinhead sized brown eruptive lesion appear on the leaves and later leaves become yellow and wither off. Disease was found in all three seasons. It is more prevalent during monsoon followed by winter.

Factors responsible for spreading of the disease -

The disease is air borne/soil born dispersing by conidia through water droplets and wind current.

Temperature of 30 - 35° C and relative humidity of 50-65 % are favorable for the outbreak of diseases development

Colony characteristics-

Curvularia is a hyphomycete (mold) fungus which is a facultative pathogen of many plant species and of the soil. Most *Curvularia* are found in

tropical regions, though a few are found in temperate zones. *Curvularia* is a dematiaceous fungus found ubiquitously in soil and is known to be associated with several plant diseases.

Colonies on PDA medium at 28±2°c are spreading, dark, olive gray, reverse bluish – black, hyphae septate and much branched. Appears as shiny, velvety- black, fluffy growth septate, dematiaceous hyphae producing brown, geniculate, conidiophores. The proconidia are curved slightly to distinctly, transversely septate with an expanded third cell from the pore end of the conidium.

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ISOLATION AND IDENTIFICATION OF MYCOFLORA ASSOCIATED WITH *SHOREA ROBUSTA* (SAL) IN THREE DIFFERENT SEASONS.

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ABSTRACT

A number of fungi were isolated from the soil of forest of *Shorea robusta* in three different sessions. An investigation was carried to study the fungal diseases of sal trees in East Mandla and Anuppur Forest Division and twenty two fungal pathogens were isolated which caused top drying. The mycoflora associated with the soil of sal forests have not been previously reported from Madhya Pradesh region of Indian. During the study, season wise successional changes in mycoflora were determined for three main seasons of the year that is summer season (March-June), rainy season (July-October) and winter season (November-February).

Key words: fungi, forests, sal, soil, disease, season.

INTRODUCTION

Sal forest is very important for both ecologically and economically growth of many states in India. The parts and products of the species of *Shorea* are economically important sources of yearlong supply for timber, resin, poles, and firewood. On the basis of recent and past research works and observation made by eminent foresters, the various causative factors responsible for sal mortality can be grouped into five categories:- Climatic factors, Edaphic factors, Management practices, Biotic factors, Insect and fungus diseases.

The parts and products of the species of *Shorea* are economically

important for timber, resin, poles, and firewood. The wood is resinous and durable, and is sought-after for construction, although not well suited to planing and polishing. The wood is specially suitable for constructing frames for doors and windows.

Soil type:- The soil of sal forest are mostly moist, slightly acid sandy to clayey, red and yellow soil. It does not tolerate waterlogging. The most favorable soil is a moist sandy loam with good subsoil drainage. This type of soil is largely found in the Madhya Pradesh and Chhatisgarh. In the Madhya Pradesh region sal tree forest is broadly

distributed to the districts of Mandla, Umaria, Dindori, Balaghat, Shehdol, Sidhi, Jabalpur and Anuppur.

Taxonomic and Morphological characters of *Shorea robusta* is moderate to slow growing, and can attain heights of 30 to 35 m. and a trunk diameter of up to 2-2.5 m., bole is clean, straight and cylindrical, but often bearing epicormic branches; Bark dark brown and thick, with longitudinal fissures deep in poles. The tree develops a long taproot at a very young age. The leaves are simple, shiny, glabrous, about 10–25 cm long and 5–15 cm broadly oval at the base, with the apex tapering into a long point. Flowers are yellowish-white, arranged in large terminal or axillary racemose panicles. Fruit at full size about 1.3-1.5 cm long and 1 cm in diameter; it is surrounded by segments of the calyx enlarged into 5 rather unequal wings about 5-7.5 cm long. In wetter areas, it is evergreen; in drier areas, it is dry-season deciduous, shedding most of the leaves in between February to April, leafing out again in April and May.

On the basis of past and recent research works and observation, the various fungi are growing and capable to caused disease in different season. According to seasonal variations, the attack of many parasitic fungi is causing major or minor diseases in sal. Some

fungi are causes dying of sal in broad area. The major fungal diseases include those caused by *Polyporus shorea* and *Polyporus gilvus*. The semi-parasite *Loranthus scurrula* can also cause increment losses (Bakshi, 1976). *Cylindrocladium floridanum* and *C. scoparium* causing leaf spot and blight in *Shorea robusta* are reported from India.

The present study aim on isolation and identification of fungi associated with soil of sal forest of Mandla and Anuppur Forest Division in three different seasons.

MATERIALS AND METHODS

Study Area - The area chosen for study and sample collection are Kotma, Jethari & Podi range in Anuppur Forest Division and Motinala range in East Mandla Forest Division. Survey conducted in three different season of the year Sept. 2013-14.

Sample collection:-

- The rhizospheric soil sample was collected from 30cm, 60cm and 90cm deep by digging the soil near sal trunk.

Procedure:-

For isolation, culturing, maintenance of stock cultures, and experimental studies were used potato dextrose agar (PDA) media. Samples were brought to the laboratory in separate sterilized polythene bags.

(Alexopoulos, 1961 and Malik, 1996). The sampled soil, a small amount of soil is transferred into a sterile petri-dish with the help of a sterilized spatula. 20 ml of melted and cooled agar medium is added to the petri-dish containing soil and the petri-dish is gently shaken so that the soil particles are dispersed throughout the agar medium. Pure culture of the desired fungus is obtained by transferring that particular fungus to agar slants. The plates were incubated in an inverted position at 28-30°C for five to seven days.

The isolated fungi were identified on the basis of morphological characteristics. The following morphological characteristics viz. colony growth, colony color and hyphae structures were recorded. For

microscopic study slides were stained by cotton blue and Lactophenol and observed under binocular microscope using 10x, 40x objectives. The morphological identification of fungal pathogen was based on the morphology of the fungal culture colony or hyphae, the characteristics of the spores and reproductive structures (Barnett and Hunter, 1998) with the help of manuals, monographs and taxonomic papers of various authors (Ellis 1971, 1976, Barnett and Hunter 1972).

RESULT AND DISCUSSION

A total 22 fungal species have been recorded from these soil samples of *Shorea robusta*. Season wise occurrences of these fungi are given below in the table 1.

Table 1- Identified fungi in different seasons

s.no.	Name of fungi	Rainy Season (July-Octo.)	Winter season (Nov.-Feb.)	Summer season (March-June)
1	<i>Alternaria alternata</i> Fr. Keissl.	+	+	-
2	<i>Alternaria citri</i> Penz.	-	+	-
3	<i>Aspergillus flavus</i> Link.	+	+	+
4	<i>Aspergillus niger</i> Tiegh.	+	+	+
5	<i>Aspergillus fumigatus</i> Fres.	-	+	+
6	<i>Cladosporium oxysporum</i>	+	-	+
7	<i>Colletotrichum dematium</i> Pers.	-	+	+

8	<i>Curvularia indica</i> Subram.	+	+	+
9	<i>Curvularia lunata</i> Wakker	+	+	-
10	<i>Exserohilum rostratum</i>	-	+	-
11	<i>Entrophospora infrequens</i>	+	+	-
12	<i>Glomus albidum</i>	+	+	-
13	<i>Glomus caledonium</i>	+	+	+
14	<i>Mucor circinelloides</i> Tiegh.	+	-	+
15	<i>Penicillium notatum</i>	+	-	-
16	<i>Phoma macrostoma</i> Mont.	+	+	-
17	<i>Rhizopus stolonifer</i> Ehrenb.	+	+	+
18	<i>Rhizoctonia solani</i> Kuhn	+	+	+
19	<i>Scutellospora coralloidea</i>	+	+	-
20	<i>Scytalidium lignicola</i> Pesante	+	-	-
21	<i>Trichoderma harzianum</i>	-	+	-
22	<i>Trichoderma asperellum</i>	+	+	-

The fungi such as *Aspergillus niger*, *Aspergillus flavus*, *Curvularia indica*, *Rhizopus stolonifer*, *Glomus caledonium* and *Rhizoctonia solani* were recorded in three seasons. Some fungi including ectomycorrhiza forming occur in summer, winter and rainy season. The details are given below.

Fungus found in three various seasons

1. Rainy Season (July- October)-

During this quarter physical character of soil color was turned to dark brown. The organic matters are higher than other season in soil because litter deposition is higher in this season. The soil moisture

and other favorable factors for growing of fungi are also higher. The members of deuteromycetes dominated over other classes in this quarter. In all sixteen fungal species were identified in the soil of sal forest during month of July to October. The *Aspergillus sp.* is dominant in all sites. These are *Aspergillus flavus*, *A. niger* and *A. fumigatus*. The frequency of phycomyceteous fungi was increased. These are *Mucor* and *Rhizopus* and they were observed in Kotma, Jethari and Motinala range. *Curvularia lunata*, *Penicillium notatum*, and *Phoma nebulosa* were appeared in Motinala

range. Some fungi including ectomycorrhiza forming occur in winter and rainy season these are, *Alternaria alternata*, *Curvularia lunata*, *Entrophospora infrequens*, *Glomus albidum*, *Phoma macrostoma*, *Scutellospora coralloidea*, and *Trichoderma asperellum*. Fungi like *Penicillium notatum* and *Scytalidium lignicola* were rarely recorded only in rainy season.

2. Winter season (November-February)- In early December both the upper layer of soil of sal forest considerably changed in the physical characteristics. On the basis of direct observation it was observed that moisture percentage of soil and atmosphere was higher. The fungal growth is also higher under cool and favorable condition. The sites also maintained their moisture by late winter rains and due to sub moist and cool condition the activity of same fungi were recorded. A total 17 fungal species were observed in this season. All fungi were produced rich sporulation under cool and moist situation. *Cladosporium oxysporum* and *Mucor circinelloides* were observe in Motinala range. Same fungi were recorded in kotima and Jethari ranges, these are *Rhizopus stolonifer*, *Glomus caledonium* and *Rhizoctonia solani*. Fungi like *Aspergillus fumigates*, and *Colletotrichum dematium* were rarely

recorded in winter and summer season. *Cladosporium oxysporum* and *Mucor circinelloides* occur in summer and rainy season. Fungi like *Alternaria citri*, *Exserohilum rostratum* and *Trichoderma harzianum* were recorded only in winter season.

3. Summer season (March-June)- The start of summer season, physical character of soil color was turned to light brown. The soil moisture and other favorable factors for growing of fungi (like organic maters etc.) are gradually fallen down. Therefore most of the fungi are dying. Only same fungi are capable to grow in this season. During this quarter the soil samples revealed less number of fungal species. Total 10 fungal species have been observed and isolated from the soil of sal forest. The most frequent colonizing fungi in all sites were recorded, these are *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus fumigates*, *Curvularia indica* and *Rhizopus stolonifer*. *Colletotrichum dematium*, *Glomus caledonium* and *Mucor circinelloides* were appeared in Kotma and Motinala range. *Aspergillus niger*, *Aspergillus fumigates*, *Aspergillus flavus*, *Cladosporium oxysporum*, *Colletotrichum dematium*, *Curvularia indica*, *Glomus caledonium*, *Mucor circinelloides*, *Rhizopus stolonifer*, and *Rhizoctonia solani* occur in summer

season. *Alternaria citri*, *Exserohilum rostratum* and *Trichoderma harzianum* were recorded only in summer season.

In this study mycoflora play an important role in the cycling of mineral nutrients by decomposing plant tissue. Most of the members of fungi are caused various types of diseases in plants. Initially the members of deuteromycete were recorded in major. Fungi like *Alternaria alternata*, *Aspergillus flavus*, *Aspergillus niger*, *Cladosporium oxysporum*, *Curvularia indica*, *Curvularia lunata*, *Rhizopus stolonifer*, and *Rhizoctonia solani* were dominant in three different seasons. These fungi extended their mycelial network in soil and surface grown fine feeder root system of sal. Due to sufficient moist ground the root network grew up superficially and well networked with the mycelium. September was found the best month for the fungal development and sporulation process. Three species of *Aspergillus* i.e. *A. niger*, *A. flavus*, and *A. fumigates* were recorded dominant. The isolates from soil samples were identified as filamentous fungi belonging to the phyla Ascomycota, Deuteromycota and Zygomycota. Most of the fungal isolates were identified to the species level. *Alternaria*, *Aspergillus*, *Colletotrichum* and *Rhizoctonia* were predominant genera. *Curvularia*, *Exserohilum*,

Exserohilum, *Rhizopus* and *Trichoderma* were the most frequently isolated genera. Rests of the strains were not identified owing to the lack of sporulating structures under presently used incubation conditions. Such strains were designated as Mycelia sterilia. In such soil fungi may occur either as resting propagules or as active mycelia depending on the availability of nutrients and favorable environmental conditions. The fast growing and concurrent appearance of these species reveals that these fungal strains are much adapted to the soil sites.

CONCLUSION

From the present investigation it is concluded that a total of twenty two fungal strains were isolated from soil samples. These fungal species of ten genera belonging to the phyla ascomycota, deuteromycota and zygomycota were successfully identified after staining with lactophenol cotton blue based on their morphological characters and microscopic analysis. Most of the fungal species were able to cause top drying or drying of sal in huge forest area. The pattern of fungal succession in the soil samples of sal forest was comparable in all the samples collected during all the three quarters of the year. The mycelium of these fungi activated infection process with onset of

monsoon. The activity of micro-fauna that was caused many diseases in seedling and sal trees. Resulting, sal mortality is higher and regeneration is poorer. In general values for higher fungal growth were observed during rainy season and the lowest during summer season. About this study that rain fall, number of rainy days, soil moisture, and temperature showed positive correlation with fungal growth.

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Identified Sal associated fungi in tree different seasons

s.no.	Name of fungi	Rainy Season (July-Octo.)	Winter season (Nov.-Feb.)	Summer season (March-June)
1	<i>Acaulospora scrobiculata</i>	+	+	+
2	<i>Alternaria alternata</i>	+	+	+
3	<i>Alternaria citri</i>	-	+	-
4	<i>Aspergillus flavus</i>	+	+	+
5	<i>Aspergillus fumigatus</i>	-	+	+
6	<i>Aspergillus niger</i>	+	+	+
7	<i>Cladosporium oxysporum</i>	+	-	-
8	<i>Curvularia indica</i>	+	+	-
9	<i>Curvularia lunata</i>	+	+	+
10	<i>Exserohilum rostratum</i>	+	+	-
11	<i>Gigaspora margarita</i>	+	+	-
12	<i>Glomus aggregatum</i>	+	+	+
13	<i>Mucor circinelloides</i>	+	-	+
14	<i>Penicillium notatum</i>	+	-	-
15	<i>Phoma macrostoma</i> Mont.	+	+	-
16	<i>Rhizoctonia solani</i>	+	+	+
17	<i>Rhizopus stolonifer</i>	+	+	+
18	<i>Scytalidium lignicola</i>	+	+	+
19	<i>Trichoderma asperellum</i>	+	+	-

घरेलू औषधियों द्वारा प्राकृतिक उपचार

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हमारे आस-पास ऐसी अनेक औषधियां उपलब्ध हैं जिनके द्वारा हम नित्य प्रयोग में होने वाले विभिन्न रोगों से मुक्ति पा सकते हैं, जिनके बारे में हम अनभिज्ञ हैं। इन औषधियों का प्रयोग कर हम विभिन्न रोगों से मुक्ति तो पा ही सकते हैं, साथ ही डॉक्टरों, वैद्यों तथा हकीमों आदि की मंहगी एवं जहरीली दवाईयों तथा उनकी मोटी फीस आदि से भी बच सकते हैं। आइये, हम इन्ही औषधियों के बारे में चर्चा करते हैं –

1. **नीम** :- यह एक उत्तम रक्तशोधक है तथा विभिन्न प्रकार के चर्म रोग, जैसे कील, मुहांसे, झाईयां आदि में इसका प्रयोग कर सकते हैं। माता (चेचक) निकलने पर प्राचीन काल में लोग आधुनिक दवाईयों का प्रयोग न कर घर के दरवाजे पर नीम की पत्तियां बांधकर रख देते थे, जो कि इलाज में बहुत कारगर साबित होता था, साथ ही यह एक अच्छा एंटीसेप्टिक भी है। एक बार एक गांव में मंदिर के पुजारी को पैर में गंभीर घाव हो गया था, उसने अनेक डॉक्टरों, वैद्यों तथा हकीमों आदि से परामर्श किया, परंतु पैर का घाव ठीक नहीं हुआ। अंत में

एक प्राकृतिक चिकित्सक की सलाह से उसने नीम के छिलकों की अंतरछाल पानी के साथ पत्थर पर घिसकर दिन में तीन-चार बार घाव पर लगाया। चंद दिनों में उसके घाव बिलकुल ठीक हो गए, जबकि डॉक्टरों ने उसका पैर तक काटवाने की सलाह दे दी थी, जिसके लिये वह कतई तैयार नहीं था।

यह भयंकर चर्मरोग में भी अति उपयोगी है। एक छः वर्षीय कन्या चार मास से एक भयंकर चर्म रोग से पीड़ित थी, जिसमें उसके बांये पैर, बांये पेट का भाग, दोनों गाल, दोनों हथेलियों के पीछे एकजमा के समान बीमारी थी, जिसमें से मवाद निकलता था, घाव हो गये थे एवं खुजली भी होती थी। उसका बहुत इलाज करवाया गया तथा इंजेक्शन आदि भी लगाये, मगर कोई लाभ नहीं हुआ। तत्पश्चात् एक प्राकृतिक चिकित्सक की सलाह के अनुसार सात नीम की पत्तियां तथा चार काली मिर्च, दो औंस जल में पीसकर नित्य प्रातः खाली पेट दिन में एक बार पिलाया। दवा पीने के दूसरे दिन से बच्ची ने प्रभावित अंग पर स्वमूत्र लगाना शुरू कर दिया। बारहवें दिन से एकजमा

सूखना प्रारंभ हो गया तथा अगले दो-तीन माह में चमत्कारी रूप से ठीक हो गया। यह चर्म रोग सफेद दाग में भी कारगर साबित हुआ है। सफेद दाग होने पर बावची का तेल और नीम का तेल मिलाकर रोगग्रस्त भाग पर दिन में दो बार लगाना लाभकारी होता है। इसके साथ नीम की 10 कोमल पत्तियां प्रतिदिन प्रातःकाल अच्छी तरह चबाकर एक-दो घूंट पानी के साथ सेवन करना चाहिए। यह मधुमेह रोग में भी अत्यंत प्रभावशाली है। नीम की आठ हरी कोमल पत्तियां नित्य प्रातः खाली पेट नाश्ते से पूर्व दांतों से चबाना और उसका रस निगलते जाना मधुमेह का अच्छा इलाज है।

2. **आंवला :-** यह विटामिन "सी" का अच्छा स्रोत है। आंवले के प्रयोग के साथ सात्विक भोजन करना चाहिए। यह एक उच्च कोटि का रसायन है। यह रक्त में से हानिकारक और विषैले पदार्थ को निकालने और वृद्ध मनुष्यों को पुनः जवान बनाने में सक्षम है। इसके नियमित प्रयोग से रक्त वाहिनियां लचीली बनी रहती है। यह रक्त वाहिनी की दीवारों की कठोरता दूरकर रक्त का परिभ्रमण भलीभांति करने में मदद करता है। रक्त वाहिनियों में लचक बनी रहने से मनुष्य को न तो हृदयघात होता है और न ही उच्च रक्तचाप का रोग होता है। रक्त का

थक्का नहीं बनने से शरीर की धमनियां नहीं फट पाती है। आंवले के निरंतर सेवन करते रहने से रस, रक्त, मांस, पेट, अस्थि, मज्जा, शुक्र, इन सब धातुओं से मलिनता एवं मृत परमाणु देह से बाहर निकल जाते हैं और उनके स्थान पर नवीन और सबल परमाणुओं का प्रवेश हो जाता है, रक्त वाहिनियां बुढ़ापे में भी लचीली बनी रहती है, चेहरे की झुर्रियां दूर हो जाती है और मनुष्य वृद्धावस्था में भी युवकों की भांति चुस्त-दुरुस्त हो जाता है।

आंवलों के मौसम में नित्य प्रातः व्यायाम अथवा भ्रमण के पश्चात दो पके हुए आंवले चबाकर खाये तथा दो चम्मच शहद ले लें। जब आंवले का मौसम नहीं हो तब सूखे आंवले का चूर्ण एक चाय की चम्मच की मात्रा में गुनगुने जल के साथ लें। ऐसा तीन-चार मास तक नित्य करते रहने से मनुष्य अपनी काया पलट सकता है। इसके निरंतर सेवन से भूख और पाचन शक्ति बढ़ जाती है, गहरी नींद आती है, सिर दर्द दूर हो जाता है। मानसिक व शारीरिक शक्ति बढ़ जाती है। दांत मजबूत हो जाते हैं, बाल काले एवं चमकीले बन जाते हैं, कांति, ओज एवं तेजस्विता की वृद्धि होती है एवं मनुष्य बुढ़ापे में भी जवान बना रहता है। इसमें रोग-निरोधक गुण होने से अनेक रोगों से

स्वतः बचाव होता है एवं व्यक्ति निरोगी रहकर दीर्घायु रहता है।

3. **तुलसी** :- प्राकृतिक आर्युविज्ञान के अनुसार तुलसी हल्की उष्ण, तीक्ष्ण, कटु, रस पाचन शक्ति को बढ़ाने वाली, कृमि और दुर्गंध नाशक, दूषित कफ एवं वायु को शांत करने वाली, पसली के दर्द को मिटाने वाली, हृदय के लिए हितकारी, मूत्र कच्छ में कष्ट को मिटाने वाली, विषविकार, कोढ़ एवं अनेक चर्म रोग, हिचकी, उल्टी, खांसी, श्वास, नेत्र रोग आदि में लाभकारी है। तुलसी की अनेक प्रजातियां हैं, मगर सामान्यतः औषधीय सर्वत्र सुलभ पवित्र तुलसी "ओसिमम सैक्टम" का प्रयोग किया जाता है, जो दो प्रकार की होती है - एक हरी पत्तियों वाली, दूसरी श्याम पत्तियों वाली। गुणधर्म की दृष्टि से श्याम तुलसी अधिक श्रेष्ठ मानी गयी है, जिसमें कफ निष्कासन एवं ज्वरनाशक क्षमता अधिक है। तुलसी में प्रबल विद्युत शक्ति होती है, जो उसके चारों तरफ दो सौ गज तक प्रवाहित होती रहती है। जिस घर में लहलहाता तुलसी का पौधा हो तो उस घर पर आकाशीय बिजली नहीं गिरती है और न ही विषाणु पनपते हैं। तुलसी की पत्तियां पूर्णिमा, अमावस्या, संक्रांति काल, कार्तिक द्वादशी, रविवार, संध्या समय, रात्रि एवं दिन के 12 बजे के आसपास तोड़ना वर्जित है। तेल

की मालिश करें, बिना नहाये, स्त्रियों के मासिक धर्म के समय एवं अन्य अशुद्धि के समय तुलसी के पौधे के स्पर्श से पौधा सूख जाता है। ज्वर कैसा भी क्यों न हो, 7-8 तुलसी की पत्तियां, 7-8 कालीमिर्च के दाने एवं 10 ग्राम मिश्री को तीन कप जल में उबालें, एक कप रह जाने पर गर्म-गर्म पीकर, बदन ढंककर 10 मिनट लेट जायें। ऐसा प्रातः एवं सांय दिन में दो-तीन बार खाली पेट करें। साथ ही भोजन में मूंग की दाल की खिचड़ी या दलिया ही लें। यह मौसमी बुखार, सर्दी-जुकाम, फ्लू, मलेरिया आदि में रामबाण है। इसी प्रकार तुलसी की चाय पीने से भी सर्दी वाला सिरदर्द, सर्दी-जुकाम, श्वास नली में सूजन सब दूर हो जाते हैं। गले की समस्या एवं श्वसन प्रणाली की झिल्ली पर अनुकूल प्रभाव पडता है। तुलसी की चाय बनाने की विधि निम्नलिखित है :- ताजा तुलसी की पत्तियां 7 से 11 तक, ताजा अदरक दो ग्राम, कालीमिर्च 7 नग (थोड़ी कूटी हुई) तीनों को 200 ग्राम उबलते जल में डालकर दो मिनट उबाल लें। तत्पश्चात नीचे उतारकर दो मिनट ढंककर रख दें। दो मिनट के बाद छानकर इसमें उबला दूध 100 ग्राम डाल दें तथा एक-दो चम्मच चीनी मिलाकर गर्म-गर्म पी लें एवं बदन ढांककर 10 मिनट लेट जायें। यदि

बच्चों को देना हो तो इसकी मात्रा आधी कर लें। आवश्यकतानुसार दो-तीन दिन तक लें, इससे साइनस का सिरदर्द भी ठीक हो जाता है। कोढ़ के समान भयंकर चर्म रोग में तुलसी की तीन पत्तियां बारीक पीसकर प्रातः खाली पेट शहद के साथ चाट लेने से एक महीने में आशातीत लाभ होता है। इसी प्रकार तुलसी से कैंसर का इलाज भी संभव है। कैंसर की अवस्था में तुलसी की 30-35 पत्तियों को दही में मथकर बने छाछ के साथ पी जायें। सुबह-शाम यह प्रयोग करने, छाछ और दही लगभग एक से ढेड़ किलो खुराक लेने से कैंसर में अच्छे परिणाम मिले हैं। कई चिकित्सकों के अनुसार तुलसी की केवल 5-7 पत्तियां पीसकर ताजे मीठे दही में मिलाकर या शहद के साथ नित्य एक बार खाली पेट चाटने से तुलसी न केवल कैंसरनाशक, बल्कि सर्व रोग नाशक सिद्ध हुई है।

सफेद दाग (ल्यूकोडर्मा) में भी तुलसी की पत्तियां बहुत चमत्कारी सिद्ध हुई हैं। तुलसी की 25 से 35 पत्तियां (बच्चों के लिये 5 से 10 ग्राम पत्तियां) खूब घोंटकर 60 ग्राम ताजे मीठे दही के साथ अथवा 1-2 चम्मच शहद के साथ सुबह नाश्ते से आधा घंटा पूर्व और कष्टसाध्य रोगों में भोजन के आधा घंटा पूर्व दिन में दो-तीन बार लें, यह बहुत

लाभकारी साबित हुआ है। हाल ही में हैदराबाद में खाद्य एवं पोषण विभाग द्वारा किए गए शोध के अनुसार यदि तुलसी की पत्तियां नियमित रूप से सेवन की जाए, तो रक्त शर्करा कम हो जाती है। यही नहीं, इसके प्रयोग से उन दवाओं को भी कम या बंद किया जा सकता है जो कि मधुमेह रोगी को नियमित लेनी पड़ती है। आजकल पश्चिमी देशों में तुलसी से एड्स की दवा बनाने का प्रयास चल रहा है। जिसमें शरीर की रोग प्रतिरोधक क्षमता नष्ट हो जाती है।

4 नीबू :- यह भी विटामिन-सी का अच्छा स्रोत है। नीबू खट्टा, वातनाशक, दीपन, पाचक, हल्का कृमिनाशक, तीक्ष्ण उदरनाशक, श्रमहारक, वात-पित्त, कफ और शूल में हितकारी अरुचि निवारक और रुचिकर है। इसके उपयोग निम्न है

- (1) जेम्स विल्ड के अनुसार नीबू स्कर्वी की रामबाण दवा है।
- (2) नीबू का रस शहद के साथ लेने से प्यास शांत हो जाती है।
- (3) गर्भजन्य मिचली को रोकने वाला एवं पाचनवर्धक है।
- (4) बवासीर, पेचिश, प्लीहा वृद्धि में लाभकारी है।
- (5) गर्म जल में नीबू का रस तथा 4-5 चम्मच शहद मिलाकर धीरे-धीरे चूसने से टॉन्सिल कम करता है।

- (6) अधिक लार बनना, आमाशय अम्लता, सीने की जलन, अपच एवं पित्त, कै में सममात्रा में नीबू का रस एवं शहद मिलाकर चाटने से लाभ होता है।
- (7) नीबू का रस और कड़वा तेल समभाग मिलाकर मसूढ़ों पर मलने से पायरिया में लाभ होता है।
- (8) पेशाब कम आने पर, मूत्र नहीं होने पर, नीबू का रस एक चम्मच तथा गाजर, खीरा, नारियल, तरबूज को एक गिलास जल में मिलाकर पी लेने से आराम मिलता है।
- (9) जल में नीबू का रस तथा ग्लिसरिन मिलाकर रात्रि सोते समय चेहरे पर लगाकर तथा प्रातः धोने से सौंदर्य बढ़ता है।
- (10) आंवले के रस में नीबू का रस मिलाकर बालों में लगाने से बालों का समय से पूर्व सफेद होना एवं गिरना रूक जाता है।
- (11) नीबू के रस में समभाग अरंडी का तेल मिलाकर पीडायुक्त जोड़ पर मलने से पीड़ा एवं कड़ापन कम हो जाता है।
- 5 **शहद** :- प्राकृतिक चिकित्सा में शहद अमृत की तरह कार्य करता है। इसके मुख्य उपयोग निम्न है :-
- (1) अतिशीघ्र शक्ति बढ़ाने वाला तथा सभी रोगों में लाभकारी है।
- (2) यह मृदु विरेचक तथा कफ निकालने वाला है।
- (3) अधिक मात्रा में देने से यह पेट दर्द ठीक करता है।
- (4) मधुमेह के रोगी को देने से रक्त में शर्करा नहीं बढ़ती है।
- (5) शहद हिमोग्लोबिन का निर्माण करता है जिससे लाल रक्त कण स्वस्थ रहते हैं।
- (6) हृदय रोगियों को एक गिलास गर्म जल के साथ दो चम्मच शहद पीने से रात्रि नींद अच्छी आती है। शहद में नीबू रस मिलाने से गुण और बढ़ जाते हैं।
- (7) सौंदर्य वृद्धि के लिये त्वचा पर शहद की मालिश कर सकते हैं। जहरीले कीड़े के डंक मारने में जलने एवं प्रदाह में उपयोगी है।
- (8) सोते समय एक चम्मच शहद लेने से बहुमूत्र रोग में लाभकारी है।
- (9) नित्य 20 ग्राम पुराना शहद चाटने से मोटापा कम होता है। जीवन की सभी अवस्थाओं में उपयोगी है।
- 6 **तरबूज** :- यह ग्रीष्म ऋतु का सस्ता, लोकप्रिय एवं सहज, सुलभ फल है, इसके निम्न उपयोग है :-
- (1) यह पुष्टिकारक, बलवर्धक, स्वादिष्ट, शीतल, पित्त को शांत करने वाला स्निग्ध तथा मूत्रल है।

- (2) मूत्र नली प्रवाह, गुर्दा तथा मूत्राशय की पथरी में अत्यंत लाभकारी है।
- (3) पेशाब के रुक जाने पर पेशाब खोलता है।
- (4) गर्मी में लू लग जाने पर खिलाने से लाभ होता है।
- (5) नियमित प्रयोग से चेहरे की झुर्रियां तथा रूखापन दूर होता है।
- (6) इसका बीज यूरिक अम्ल तथा पथरी को गलाने के काम आता है।
- (7) पत्तियों का स्वरस नेत्र में डालने से नेत्ररोग में लाभप्रद है।
- (8) पत्तियों का रस जुकाम में लाभप्रद है। इसकी पत्तियां मधुमेह में भी उपयोगी है।
- (9) अतिसार, मंदाग्नि, उदर-शूल एवं दस्त, कब्जियत आदि में बेल रामबाण है।

7 **आम** :- डाल से पका आम सर्वश्रेष्ठ होता है। इसमें निम्नलिखित तत्व भी होते हैं।

- | | | |
|--------------------|---|--------------|
| (1) पानी | - | 86.1 प्रतिशत |
| (2) कार्बोहाइड्रेट | - | 11.8 प्रतिशत |
| (3) प्रोटीन | - | 0.1 प्रतिशत |
| (4) कैल्शियम | - | 0.01 प्रतिशत |
| (5) खनिज | - | 0.3 प्रतिशत |
| (6) फास्फोरस | - | 0.02 प्रतिशत |
| (7) फाइबर | - | 11 प्रतिशत |

इसके अतिरिक्त 100 ग्राम आम में -
लोहा - 0.3 मि.ग्रा., विटामिन सी - 14 मि.ग्रा., उष्णांक - 50 कैलोरी।

आम से प्रमेह, धातु दुर्बलता, स्वप्नदोष, अनिद्रा, आंत, त्वचा रोग, गठिया, नेत्ररोग, हृदय रोग, नपुंसकता, कमजोरी, स्नायु दुर्बलता आदि में लाभप्रद है। आम की कोमल छाल रुचिकर, कफ, पित्तनाशक है। बौर को पीसकर फोडा-फुंसी, दाद पर लगाने से तत्काल लाभ होता है। बौर को पीसकर कनपटी पर लगाने से उभरता मोतियाबिंद रुक सकता है। कच्चे आम को भूनकर उसका रस निकालकर शहद, पुदीना मिलाकर पीने से लू में लाभप्रद है। आम और दूध का कल्प लेने से दुबला-पतला व्यक्ति तगड़ा बन सकता है। मधुमेह रोगियों के लिये आम वर्जित है।

8 **बेल** :- बेल के उपचारात्मक गुण निम्नलिखित हैं :-

- (1) बेल कसैला, कड़वा, मलरोधक, रूखा, अग्निवर्धक, पित्तजन्य, वात, कफ नाशक, बलकारक, हल्का, गर्म और पाचक है।
- (2) पर्याप्त मात्रा में फुजला होने से महान कब्ज नाशक है।
- (3) रासायनिक दृष्टि से बेल पूर्ण भोजन है।

- (4) बेल का कच्चा फल स्निग्ध, भारी, रुचिकर, जठराग्नि को बढ़ाने वाली, मलरोधक, पाचक, कड़वा, हल्का कसैला, शूल, आमवात एवं कफ नाशक है।
- (5) बेल का पका हुआ फल दाहजनक, मधुर, भारी, कब्ज दूर करने वाला, कड़वा, गर्म एवं ग्राही है।
- (6) पके हुए बेल का गाढ़ा शर्बत सारक है।
- (7) पत्तियों का स्वरस नेत्र में डालने से नेत्ररोग में लाभप्रद है।
- (8) पत्तियों का रस जुकाम में लाभप्रद है। इसकी पत्तियां मधुमेह में भी उपयोगी है।
- (9) अतिसार, मंदाग्नि, उदर-शूल एवं दस्त, कब्जियत आदि में बेल रामबाण है।

9 **जामुन** :- जामुन तीन प्रकार का होता है :- (1) बड़ा जामुन (2) छोटा जामुन (3) जल जामुन। लगभग सभी में एक जैसे तत्व पाये जाते हैं, बड़े में मिठास अधिक, गुठली छोटी होती है, लेकिन छोटे में मिठास कम तथा गुठली बड़ी होती है। उपचार की दृष्टि से छोटा जामुन अधिक उपयोगी होता है। जामुन के औषधीय गुण निम्नलिखित हैं:-

- (1) प्राकृतिक आर्युविज्ञान के अनुसार यह भारी विष्टभकारक, कसैला, स्वादिष्ट, शीतल, अग्निदूषक, कफ एवं पित्तनाशक है।
- (2) इसका फल रुचिकारक, मधुर, स्तम्भक, भारी, रोगनाशक एवं स्वादिष्ट है। यह अतिसार, कफ एवं खांसी दूर करता है।
- (3) कच्चे एवं हरे फल में टैनिन अम्ल अधिक होता है जो कि रक्त स्राव को रोकने में सहायक है।
- (4) गले में खराश एवं आमाशय प्रदाह में इसका गरारा उपयोगी है।
- (5) प्रदर एवं योनिप्रवाह में इसके काढ़े का रस उपयोगी है।
- (6) 7-15 ग्राम चूर्ण दस्त एवं पेचिश में उपयोगी है।
- (7) जामुन का फल एवं गुठली रक्त शर्करा घटाने में सहायक है, इस प्रकार मधुमेह की रामबाण दवा है।
- (8) बढ़े यकृत एवं प्लीहा में उपयोगी है।
- (9) विषैले जन्तु का जहर कोमल पत्ती का रस देने से दूर होता है।
- (10) कोमल पत्ती का रस सांस की बदबू एवं दांत दर्द दूर करता है।

(11) बीज में जम्बोलिन एवं इलैजिक अम्ल होता है जो कि मधुमेह एवं पेचिश में उपयोगी है।

10 **गाजर** :- एक गाजर के बीज का चूर्ण गाय के दूध एवं शहद के साथ लेने से नपुसंकता, मासिक धर्म की कमी, स्तनों में दूध की कमी, जलोदर जैसे रोग में लाभप्रद है। गाजर का रस कैंसर, अकौता, मोतियाबिंद आदि की रामबाण दवा है। एक गिलास गाजर, 10 मि.ली. आंवले का रस, दो चम्मच शहद एवं बादाम गिरी 10 का प्रतिदिन सेवन करने से मस्तिष्क की कमजोरी, पैटिक अल्सर, मूत्र नली की पथरी, श्वास, दमा, कैंसर, रतौंधी एवं स्नायु दुर्बलता आदि रोग दूर होते हैं। गाजर को चबा-चबाकर खाने से कब्जियत मिटती है, पेशाब खुलकर आता है, रक्त साफ होता है, मुंह की दुर्गन्ध दूर होती है। कच्चे गाजर में शहद लगाकर खाने से नपुसंकता दूर होती है। शुक्राणुओं की वृद्धि होती है। वीर्य गाढ़ा हो जाता है। कच्चे गाजर को खूब चबाकर खाने से मसूढ़ों से खून आना बंद हो जाता है तथा दांत चमकीले हो जाते हैं।

11 **पपीता** :- यह एक अच्छा लीवर टॉनिक है। यह गैस, कब्जियत, बवासीर आदि की रामबाण दवा है। झाड़ से पका पपीता सर्वश्रेष्ठ होता है। पपीते के मौसम में प्रातःकालीन नाश्ते में प्रतिदिन इसका

सेवन करना चाहिए। गर्भवती स्त्री इसका सेवन नहीं करें।

12 **खजूर** :- यह बहुत बलवर्धक होता है। इसमें भरपूर मात्रा में लोहा, कैल्शियम, फास्फोरस, पोटेशियम आदि होने से बलवर्धक माना गया है। यह त्रिदोष (वात, पित्त, कफ) को शांत करने वाला है। खजूर खाकर ठंडा जल पीने से लू एवं गर्मी का प्रकोप कम होता है। यह ज्वर एवं दाह को शांत करता है। बार-बार पेशाब आने में लाभकारी है।

यौन शक्ति बढ़ाने के लिये 10 खजूर एवं 1 ग्राम सफेद इलायची पीसकर बकरी के धारोष्ण दूध के साथ लेने से नपुसंकता नष्ट होती है, भ्रूण का विकास अच्छा होता है तथा प्रसववेदना नष्ट होती है। यह वीर्य गाढ़ा करता है तथा व्यक्ति को वृद्धावस्था में भी युवावस्था का आभास होता है। बच्चों को दस्त एवं पेचिश के समय खजूर का बीज पीसकर शहद के साथ मिलाकर दिन में तीन-चार बार देने से लाभ होता है। 5 खजूर एवं 10 नीम की कोपलें प्रातः एवं सांय लेने से मधुमेह में लाभ होता है।

11 **अंजीर** :- यह दमा और बवासीर में अत्यधिक लाभकारी है। दमा की अवस्था में कलई किये बर्तन में 3 अंजीर 24 घंटे तक जल में भिगोकर रखें, प्रातः अंजीर को उसी जल में उबाल लें, सूर्योदय से पूर्व उठकर शौच, स्नान आदि से निवृत्त होकर

उगते सूर्य के सामने पीपल के वृक्ष के नीचे बैठकर 10-12 बार अनुलोम-विलोम प्राणायाम करें तत्पश्चात् इन उबले अंजीरों को खूब चबाकर खा लें और वही जल पी लें, इससे दमें में अवश्य लाभ होगा।

बवासीर की अवस्था में दो सूखे अंजीर शाम को जल में भिगों दें। प्रातः खाली पेट इसे खा लें। इसी प्रकार प्रातः दो अंजीर जल में भिगों दे, उसे सायं लगभग 5 बजे खा लें, खाने के पूर्व एवं बाद एक-दो घंटे तक कुछ नहीं खायें। आठ-दस दिन के सेवन से खूनी-बादी, हर प्रकार की बवासीर ठीक हो जाती है।

12 किशमिश :- किशमिश आयुर्वेद अनुसार स्निग्ध, भारी, मधुर, वात और पित्तनाशक, हृदय हितकारी, रक्त पित्तशामक, ज्वरनाशक, ताप और दाहनाशक कफ निकालने वाली मृदु विरेचक, निर्बलता नाशक, जीवनदायिनी, जी मिचलाना बंद करने वाली, प्यास मिटाने वाली होती है। यह दिल की कमजोरी, खांसी, ज्वर, प्यास, मूत्र की रुकावट एवं कब्ज आदि में लाभप्रद है।

प्रातः 250 ग्राम दूध में 10 ग्राम किशमिश और मिश्री का चूर्ण एक चम्मच डालकर उबालें फिर किशमिश खा लें और दूध पी लें। नित्य प्रातः 15 दिन तक लें। इससे दिल की धड़कन, तेज नब्ज कम करने के लिये प्रभावकारी एवं हृदय शक्तिवर्धक है।

13 मुनक्का :- यह कब्जियत मिटाने वाली शक्तिवर्धक एवं दिल की धड़कन कम करने वाली है। मुनक्का 10 दानों को रात्रि आध कप जल में भिगों दें। प्रातः बीज निकालकर खा लें तथा वह जल पी लें। ऐसा एक मास तक करें। हृदय की घड़कन सामान्य हो जायेगी।

विशेष :- मधुमेह रोगी कृपया किशमिश व मुनक्का का प्रयोग नहीं करें।

14 लहसुन :- यह वात प्रवृत्ति वाले व्यक्तियों के लिये वरदान है। यह खून की चर्बी (कोलेस्ट्रॉल) कम करने के लिये बेजोड़ है। लहसुन रक्त में कोलेस्ट्रॉल की मात्रा घटाने, उच्च रक्तचाप कम करने और ट्यूमर बनने से रोकने में लाजवाब है। लहसुन पर हाल ही में 200 से अधिक वैज्ञानिकों ने अध्ययन कर यह आश्चर्यजनक तथ्य निकाले हैं। इटली में 432 रोगियों पर किये गये अध्ययन से इस बात की पुष्टि हुई है कि लहसुन में पाये जाने वाली गंधक की मात्रा कोलेस्ट्रॉल की मात्रा कम करती है, खून के थक्के के निर्माण को रोककर रक्तचाप घटाती है। लहसुन एंटी बायोटिक, एंटी फंगल व एंटी वायरल है। जो व्यक्ति प्रत्येक शीत ऋतु में अमृत तुल्य लहसुन का सेवन करता है, वह स्वस्थ, दीर्घायु एवं विविध रोगों से मुक्त हो जाता है। यह शरीर में रक्त संचार को सुचारु रूप से गतिशील रखता

है तथा रस एवं रक्त को पूर्ण रूप से शुद्ध करता है। यह आमवात, गठिया, सायटिका, गर्दन की हड्डियों की सूजन, कटिवात, कमर दर्द, लकवा, आदि में कारगर चिकित्सा है। यह हृदय रोग एवं गैस आदि में भी उपयोगी है। पेशाब व पसीना खुलकर आते हैं। दुर्गन्धयुक्त बलगम दूर होता है। यह पुरानी खांसी, क्षय, फेफड़ों के रोग आदि को समूल नष्ट करता है। लहसुन ही एक ऐसा खाद्य पदार्थ है, जो शरीर की कोशिकाओं की धीरे-धीरे मरम्मत कर उनमें नवजीवन संचार करता है।

प्रातःकाल खाली पेट लहसुन की 3-4 कलियां छीलकर प्रत्येक कली के 3-4 टुकड़े कर उनको एक-एक कर कैप्सूल की तरह सेवन करें।

विशेष :- लहसुन प्रयोगकाल में केवल सात्विक भोजन लें। इसका प्रयोग केवल शीत ऋतु में ही करें। गर्म मिजाज तथा पित्त प्रवृत्ति वाले व्यक्ति इसका उपयोग नहीं करें। गर्भवती स्त्री, कुष्ठ रोगी, मूत्राशय और मूत्रपिंड की सूजन, स्वप्नदोष, उल्टी, रक्त के रोगी, अत्यंत दुर्बल व्यक्ति इसका सेवन नहीं करें।

15 हल्दी :- यह उष्ण प्रवृत्ति का एक अच्छा एंटीसेप्टिक है। इसका उपयोग सौंदर्य प्रसाधन सामग्री के रूप में भी होता है। स्त्रियां अपनी सौंदर्य वृद्धि के लिए

बेसन और हल्दी का उबटन बनाकर लगाती है। शीत ऋतु में जुकाम हो जाने पर गर्म दूध में एक चाय का चम्मच हल्दी डालकर पीने से लाभ होता है। यह शरीर के आंतरिक टूट-फूट की मरम्मत करता है। 200 ग्राम उबलते हुए दूध में ½ चाय का चम्मच हल्दी का चूर्ण मिलाकर दो-तीन बार उबाल लें। इस हल्दी के दूध के पीने से गुम चोट का दर्द व सूजन दूर होती है एवं भीतरी चोट ठीक होती है। शरीर की टूट-फूट दूर होती है। आवश्यकतानुसार प्रातः एवं रात्रि दो-तीन दिन तक लें। हल्दी के चूरण का ब्रश करते रहने से दांत एवं मसूढ़े स्वस्थ रहते हैं। चोट में, हड्डी टूट जाने पर भी पिंसी हुई हल्दी एक चम्मच, गुड़ एक साल पुराना, एक चम्मच, देशी घी दो चम्मच, तीनों एक कप जल में उबालें, जब आधा जल रह जाए तो दिन में एक बार लें। आवश्यकतानुसार 15 दिन तक लें, इससे बहुत शीघ्र लाभ होगा। गर्मी के दिनों में यह प्रयोग सावधानीपूर्वक करें।

सौंदर्य वृद्धि हेतु आजकल बाजार में इसकी क्रीम विको टरमरिक उपलब्ध है। सफेद दाग (ल्यूकोडर्मा) में हल्दी 4 ग्राम प्रातः एवं सायं एक पाव दूध के साथ 5-6 मास तक निरंतर लेने से रोग ठीक होते देखा गया है।

16 अजवायन :- यह पाचन क्रिया में बहुत लाभदायक है, पेट दर्द होने पर अजवायन का चूर्ण 6 भाग और काला नमक (पिसा हुआ) एक भाग लेकर मिला लें, इसमें से आधा चम्मच गर्म जल के साथ लेने से पेट दर्द में आराम मिलता है। बच्चों को आधी मात्रा में देना चाहिए। इससे अफारा, वायु, पेट की गैस आदि मिटती है।

गुनगुने पानी के साथ केवल अजवायन का चूर्ण लेने से बदहजमी, खांसी, पेट दर्द, तिल्ली, कफ और वात की अनेक समस्याएं दूर होती हैं, पेट के छोटे-बड़े कीड़े नष्ट हो जाते हैं। अकेले अजवायन में ही चिरायते का कटुपौष्टक, हींग का वायुनाशक और काली मिर्च का अग्निदायक गुण समाया हुआ है। मात्र अजवायन सैकड़ों प्रकार के अन्न पचा सकती है। पेट दर्द, अफारा, वायुगोला, कफ, वात, शूल शमन, कृमि, बवासीर एवं संक्रमण रोगों में लाभकारी है।

17 अदरक :- यह तेज बुखार, सूखा जुकाम, खांसी, हिचकी, दांत दर्द आदि में उपयोगी है। तेज नजला में 3-4 ग्राम अदरक कुचलकर चाय बनाते समय एक कप पानी में डालकर अच्छी तरह उबालें, फिर इसमें चाय की पत्ती, दूध, चीनी डालकर चाय बनायें, रात्रि सोते समय लें। मात्र तीन दिन में नजला ठीक को

जायेगा। इसी प्रकार बलगमी खांसी में अदरक का रस, पान (नागरबेल) का रस और शहद तीनों सममात्रा में मिला लें। इसे प्रातः एवं सायं आधा चम्मच चाटे, तीन-चार दिन में ही लाभ होगा। तेज खुश्क खांसी में अदरक का एक छोटा टुकड़ा मुंह में रखकर चूसते रहें।

इसी प्रकार दांत दर्द में अदरक का टुकड़ा कुचलकर दर्द वाले दांत के खोखले भाग में रखकर मुंह बंद कर लें और धीरे-धीरे चूसते रहें, शीघ्र राहत महसूस होगी।

18 धनिया :- यह त्रिदोषहारक, दीपन, पाचक, तृष्णा नष्ट करने वाली (खाने में अरुचि नष्ट करने वाली) यकृत (लीवर) के लिये लाभकारी, पेशाब खुलकर लाने वाली है। यह अजीर्ण, भोजन में अरुचि, वमन, मंदाग्नि, अतिसार, उदर-शूल, अर्श (बवासीर), श्वासकष्ट, मूत्रकृच्छ, प्रमेह आदि में लाभकारी है।

19 पुदीना :- पुदीना की पत्तियां छाया में सुखाकर बारीक चूर्ण बनाकर एक शीशी में रख लें और दूसरी में काली मिर्च बारीक पीसकर चूर्ण बनाकर रख लें। प्रातः एवं सायं प्रत्येक भोजन के बाद दो चुटकी भर चूर्ण (पुदीना में से) एक चुटकी भर चूर्ण काली मिर्च मिलाकर खायें, उपर से एक घूंट पानी पी लें। ऐसा करते रहने से गैस, एसिडिटी बनना बंद होगा। हृदय भी कभी फेल नहीं होगा, क्योंकि काली मिर्च

में खून को पतला बनाये रखने और खून में थक्का बनने से रोकने का विशेष गुण है।

20 जीरा (सफेद) :- यह लघु रूक्ष, कटु, मधुर, उष्णवीर्य, कफ, वातनाशक, पित्तवर्धक, रेचक, दीपन, पाचक, ग्राही, शूलशमन, कृमि को नष्ट करने वाला, उत्तेजक, कटुपौष्टिक, बाजीकरण, रक्त शोधक, मूत्रल, वेदनानाशक, गर्भाशय शोधक है। अरूचि, वमन, अग्निमांघ, अजीर्ण, उदरशूल, अर्श, रक्तविकार, श्वेतप्रदर, नूतन एवं जीर्ण ज्वर, विशेषतः वातप्रधान ज्वर आदि में बहुत उपयोगी है। यह मूत्र जननेन्द्रिय के विकार, सुजाक, मूत्र अवरोध आदि में अधिक उपयोगी माना जाता है।

(काला) :- यह कटु, उष्णवीर्य, अवसादक, वेदनानाशक, स्पर्शज्ञात नाशक, निद्राकारक, अक्षेप-निवारक एवं वातनाशक है। इसका लेप लगाने से स्पर्श, ज्ञान में कमी आकर पीडा शांत होती है। यह किसी स्थान विशेष पर जमें हुए रक्त को बिखेर देता है। मांसपेशियों पर इसकी क्रिया अफीम जैसी होती है। मांसपेशियों को सुस्ताकर एवं मस्तिष्क क्रिया को मंद कर यह निद्रा लाता है।

21 काली मिर्च :- यह लघु, तीक्ष्ण, कटु एवं उष्ण है, किन्तु इसका हरा एवं ताजा फल मधुर एवं किंचित उष्ण होता है।

सर्दी-जुकाम, खांसी, श्वास नली की सूजन, दमा आदि में काली मिर्च की चाय बहुत उपयोगी है। इसके अतिरिक्त इसमें खून को पतला बनाये रखने और खून में थक्का बनने से रोकने का विशेष गुण भी है। अतः ठंड में काली मिर्च की चाय पीना बहुत उपयोगी है। इस प्रकार हम देखते हैं कि ये घरेलू औषधियां बहुत उपयोगी हैं एवं इनके सेवन से हम अनेक रोगों से मुक्ति पा सकते हैं। हमें केवल इनकी मात्रा एवं प्रयोग विधि का ज्ञान होना चाहिए।

संदर्भ ग्रंथ :-

- 1 स्वदेशी चिकित्सा सार – लेखक – डॉ. अजीत मेहता, आयुर्वेदाचार्य
- 2 वनोषधि (जड़ी-बूटी) चित्रावली – लेखक – डॉ. महेश चन्द्र, आयुर्वेदाचार्य
- 3 डवास नेचर गाइड – लेखक – डॉ. आर. एन. डवास, प्राकृतिक चिकित्सक
- 4 आहार ही औषधि है – लेखक – डॉ. हीरालाल, प्राकृतिक चिकित्सक
- 5 प्राकृतिक इलाज – लेखक – डॉ. धर्मचंद सरावगी, प्राकृतिक चिकित्सक

अंत में मैं श्री फिलिप डेनियल फ्रांसिस का अत्यंत आभारी हूँ, जिन्होंने इस लेख की टायपिंग एवं प्रूफ रीडिंग कार्य में मेरी मदद की है।

Publications (Available for sale)

1. Technical bulletins

SN.	Bulletin No.	Title	Year	Price
1	2	Volume Table of <i>Terminalia tomentosa</i> for M.P.	1963	70.00
2	4	Yield Table of Sal for M.P.	1966	70.00
3	5	Seed Directory vol. I	1967	30.00
4	9	Standard Volume Table of Teak for S.Chhindwara in M.P.	1971	70.00
5	10	Family <i>Ranunculaceae</i> to <i>Polygonaceae</i> in M.P. (Monograph of 13 family)	1971	25.00
6	11	Teak growth tables of different ecological forest types in M.P.	1971	70.00
7	12	Standard volume tables of <i>Boswellia serrata</i> for Nimar tract in M.P.	1971	70.00
8	15	Bark Table for <i>Boswellia serrata</i>	1971	25.00
9	16	Family <i>Linaceae</i> to <i>Berberaceae</i>	1974	25.00
10	18	Species for plantation in M.P. (Reprint) मध्यप्रदेश में वृक्षारोपण के लिये उपयुक्त प्रजातियां	1977 1977	100.00 100.00
11	22	Bamboo Plantation	1986	50.00
12	23	Fuel wood removal by headloads-A case	1987	20.00

		study of Jabalpur		
13	24	Eucalyptus cultivation in M.P. – JTF	1987	25.00
14	26	Socio-economic Potential of Minor Forest Produce in M.P.	1991	75.00
15	28	Material for forest flora of Madhya Pradesh	1996	150.00
16	29	Tissue culture protocols for Teak, Neem & Khamer	1997	150.00
17	30	Growth statistics of forest plantations	1997	75.00
18	31	Medicinal plant of M.P. distribution, cultivation & trade	1998	200.00
19	32	Local Volume Table for Teak, Sal and other species	1997	60.00
20	33	Price Trends of some medicinal plants	1998	80.00
21	34	Biological Diversity of SFRI premises	1998	50.00
22	35	Seed production in Teak Seed Orchards in M.P.	1998	100.00
23	36	Seed certification protocol of forest tree species	1998	75.00
24	37	Tissue culture protocols for important medicinal plants of M.P.	1998	30.00
25	38	Macro-propagation protocol of some tree and medicinal plants species.	1998	40.00
26	39	Yield and stand tables of teak in Madhya Pradesh	1998	200.00

27	40	An Annotated Bibliography of Bamboo	1999	50.00
28	41	Status survey of Non Timber Forest Produce in primary Tribal Markets: A case study in Amarkantak Plateau.	1999	100.00
29	42	Application of laboratory seed testing results in nursery practices.	2000	50.00
30	43	म.प्र. में भिलवा का सामाजिक आर्थिक विश्लेषणात्मक अध्ययन।	2000	100.00
31	44	Silviculture research in M.P.	2000	150.00
32	45	Handbook of Bamboos with particular reference to M.P.	2002	80.00
33	46	औषधीय पौधों की खेती की प्रचार प्रसार पत्रिका ।	2003	150.00
34	47	Medicinal herbs in trade: a study of safed musli, (chlorophytum species) in Madhya Pradesh	2003	20.00
35	48	Collection, processing and marketing of <i>Buchanania lanzan</i> in Madhya Pradesh	2005	20.00
36	49	मध्यप्रदेश के महत्वपूर्ण आयुर्वेदिक पादप	2005	70.00
37	50	आंवला वृक्षारोपण एवं आर्थिक महत्व	2008	50.00
38	51	उच्च गुणवत्ता के बीज एकत्रीकरण, भण्डारण, उपचारण, प्रमाणीकरण तथा बीजोत्पादन क्षेत्रों के चयन एवं प्रबंधन पर दिग्दर्शिका।	2008	50.00
39	52	Floral Diversity of Kanha Tiger Reserve	2009	900.00

40	53	Nursery and Planting technique of Tree Species	2010	100.00
41	54	Forest Glossary for All (English – Hindi)	2010	50.00
42	55	मध्यप्रदेश वृक्षारोपण मार्गदर्शिका	2011	150.00

2. Extension series

Ext. Series	Title	Year	Price
1.	Teak Seed collection and uses	1981	10.00
2.	वृक्षारोपण में बीजों का महत्व	1981	15.00
3.	म.प्र. में साल रोपण की तकनीक	1991	15.00
4.	पड़त भूमि विकास हेतु उपयुक्त प्रजाति लेडिंगा	1991	10.00
5.	ईसबगोल	1994	5.00
6.	सर्पगन्धा	1994	5.00
7.	रोसा घास	1995	5.00
8.	A mechanical device for pre sowing treatment of teak seeds	1995	5.00
9.	वृक्षारोपण कैसे करें	1996	25.00
10.	S.F.R.I Publications	1999	40.00
11.	माइकोराइजा (वैम)	1999	-
12.	राजजोबियम	1999	-
13.	एजेटोबेक्टर	2000	-
14.	पी.एस.बी. (फास्फोरस विलायक)	2000	-
15.	आँवला : वनो से किसानों तक	2000	40.00

16.	बाँस : वनो से किसानों तक	2000	40.00
17.	सागौन : वनो से किसानों तक	2000	60.00
18.	खमेर : वनो से किसानों तक	2000	60.00
19.	यूकेलिप्टस : वनो से किसानों तक	2000	50.00
20.	बच (एकोरस केलेमस)	2001	5.00
21.	सतावर (एस्पेरेगस रेसीमोसस)	2001	5.00
22.	सफेद मूसली (क्लोरोफाइटम बोरिविलियानम)	2001	5.00
23.	कलिहारी (ग्लोरिओसा सुपरबा)	2001	5.00
24.	सनाय (केसिया आगस्टफोलिया)	2001	5.00
25.	सर्पगंधा (रावोल्फिया सर्पेन्टिना)	2001	5.00
26.	अष्वगंधा (विद्यानिया सोमनीफेरा)	2001	5.00
27.	मुष्कदाना (एबलमासकस मास्केटस)	2001	5.00
28.	लेमनग्रास (सिंबोपोगन फ्लेक्सिपोसस)	2001	5.00
29.	मेन्था या पोदीना (मेन्था आर्वेसिस)	2001	5.00
30.	लघुवनोपजों का प्राथमिक प्रसंस्करण (भाग 1)	2003	20.00
31.	लघुवनोपजों का प्राथमिक प्रसंस्करण (भाग 2)	2007	20.00
32.	Directory of Medicinal Plants Trades and ISM Industries of Central India	2009	100.00

33	Monograph on <i>Alectra chitrakutensis</i>	2011	60
34	Monograph on <i>Ceropegia bulbosa</i> Roxb. and <i>ceropegia macrantha</i> .	2011	60
35	Monograph on <i>Crateva magna</i> (Lour.) and <i>ficus cupulata</i> .	2011	60
36	Monograph on <i>Dioscorea tomentosa</i> koenigex. and <i>D.Alata</i>	2011	60
37	Monograph on <i>Flemingia stricta</i> Roxb and <i>F. Paniculata</i> Wallich	2011	60
38	Monograph on Guggal	2011	60
39	Monograph on Maida tree (<i>Litsea Glutinosa</i>)	2011	60
40	Monograph on Padri tree	2011	60
41	Monograph on Shyonaka	2011	60
42	Some ethnic plants in cure of various human diseases	2011	250

- Note :**
1. Payment for the above bulletins and extension series may be made by Demand Draft in favour of the Director, State Forest Research Institute, Polipathar, Jabalpur (M.P.) 482008
 2. Payment for the Bulletin No. 24 (Eucalyptus cultivation in M.P.) may be made by D.D. in favour of the Treasurer, Society for Tropical Forestry Scientists, SFRI, Jabalpur.