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RESEARCH ARTICLE

In vitro Regeneration of Phyllanthus *maderaspatensis* L. – A Traditional Medicinal Plant

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ABSTRACT

An efficient micropropagation system was developed for *Phyllanthus maderaspatensis* L., a traditional and valuable medicinal plant. We report herein for the first time successful recovery of fertile plants of *Phyllanthus maderaspatensis* from shoot tip and nodal explants. Explants were cultured on MS medium supplemented with different concentrations of 6-Benzylaminopurine (BAP), Kinetin (KIN) and Thidiazuron (TDZ) with 15 % Coconut water. Maximum number of shoots (86.88 %) was observed from shoot tip on MS medium supplemented with BAP (3.0 mg/l), 15 % coconut water, 30 g/L sucrose and 8 g/L agar. *In vitro* regenerated shoots were cultured on rooting medium containing half strength MS basal medium supplemented with different concentration of Indole-3-butyric acid (IBA), Indole-3-acetic acid (IAA) and Naphthalene acetic acid (NAA). Maximum frequency (93.2 %) of roots induction was observed on medium containing IBA (1.0 mg/l). The fully regenerated plants were transferred to paper cup containing mixture of sterile soil and manure 2:1 ratio. The plant in paper cups were maintained in the environmental growth chamber for acclimatization. Eighty eight percentage of the plantlets were successfully acclimatized and established in soil.

Key words : *Phyllanthus maderaspatensis*, Euphorbiaceae, Hepatoprotective, *In vitro* regeneration, shoot tip, nodal explant, medicinal value.

INTRODUCTION

The exploitation of tissue culture techniques in medicinal plants is indeed desirable for their *in vitro* propagation and extraction of important chemical compounds [1]. *Phyllanthus maderaspatensis* Linn. (Euphorbiaceae) is a traditional herbaceous medicinal plant. The leaves are expectorant, diaphoretic and useful in strangury and sweats. The seeds have a bad taste and are carminative, laxative, tonic to the liver, diuretic and useful in bronchitis, ear-ache, griping, ophthalmia and ascites. In South India, an infusion of the leaves is given for headache [2]. It is also know as kidney cleansing herb or stone breaker and also possess significant hepatoprotective activity [3]. Preliminary studies have shown the remarkable hepatoprotective activity of this plant powder (water suspension) at a dose of 500 mg/kg against acetaminophen-induced liver damage in Wistar rats [4]. Besides, *Phyllanthus fraternus* and *Phyllanthus maderaspatensis* also reported to show hepatoprotective activity against carbon tetrachlorideinduced mitochondrial dysfunction [5] and acetaminophen-induced hepatotoxicity [6] respectively.

In India, *P. maderaspatensis* is widely used medicinally to treat headache, bronchitis, earache and ophthalmia. Powder from dried plant material mixed with milk is taken to treat jaundice; an herbal medicine called "Bhumyamalaki" is sold which may be pure *Phyllanthus amarus* or pure *P. maderaspatensis* L. or a mixture with *Phyllanthus fraternus* G.L. Webster [7]. Many modern medicines derive from traditional practices. Herbs of the subgenus *Phyllanthus* were tested against hepatitis B virus (HBV) because used it is in the treatment of jaundice [8].

Micropropagation is one of the oldest methods of asexual propagation that has proved effective for *in vitro* propagation of medicinal plants for commercial application [9]. In recent years, there is an increased interest for *in vitro* culture techniques which offer a viable tool for mass multiplication and germplasm conservation of rare, endangered, and threatened medicinal plants [10]. As a reported regeneration of *P. amarus* from shoot tips buds, however its regeneration from node and internodes is lacking [11].

This plant species is a favorite choice of the rural people because of its immense medicinal properties like antidote, against liver diseases, antiviral properties**,** antioxidant, heptoprotective, anti inflammatory and strong inhibitory effect against neurogenic [12, 13, 14]. These medicinal properties are due to the presence of several natural compounds especially phyllanthin, hypophyllanthin, quercetin and β-sitosterol [15, 16]. Micropropagation technique has proved an alternative method for propagation of *P. amarus* plants [17, 18, 19]. Callus culture and root culture protocols have been developed for the medicinal plant *Phyllanthus urinaria* using single node explants [20] and in multiple shoot regeneration *Phyllanthus amarus* [19, 21].

Now a days plant based medicines are slowly gaining importance. Today due to various reasons, several medicinal plants are disappearing to deforestation. Furthermore, the *in vitro* technology could be a cost-effective mean for high-volume production of the elite planting material throughout the year, without any seasonal constraints. Therefore, there is an urgent need to develop an appropriate protocol for mass propagation and conservation of this valuable medicinal plant. The present study presents findings of an experiment to work out a suitable protocol for efficient regeneration of *Phyllanthus maderaspatensis* L. To our knowledge, this is the first report of the successful and established an efficient protocol for high frequency of shoot regeneration of *Phyllanthus maderaspatensis* L.

MATERIALS AND METHODS

Plant material and disinfection

Plants of *Phyllanthus maderaspatensis* from natural habitat were collected and maintained in the Botanical garden of Bharathidasan University, Tiruchirappalli, Tamil Nadu, India. Shoot tip and Nodal segments were excised from one-month-old healthy *in vivo* plants used for this experiment. Explants were washed thoroughly in tap water, then in Teepol 5 % (v/v) for 5 min. and washed several times with sterile distilled water under aseptic conditions. For surface sterilization, explants were rinsed in 70 % (v/v) alcohol for 45 sec. followed by aqueous mercuric chloride solution (0.1 % w/v) for 5 min. and washed 5 times with sterile distilled water in the laminar hood.

Culture conditions

Shoot tips and nodal segments were cultured on Murashige and Skoog (MS) [22] medium supplemented with different concentrations of BAP, KIN and TDZ (1.0 -5.0 mg/l) individually and 15 % coconut water (CW). The medium contained 30 g/L sucrose and the pH of the medium was adjusted to 5.6 - 5.8. It was then solidified with 8 g/L agar (Agar type I, Himedia, India) and autoclaved at 121°C for 15 minutes at 105 kPa. About 10 ml of the medium was dispensed into each test tube and closed with non-absorbent cotton plugs. Cultures were incubated at 25 ±2°C under 16:8 h light:dark cycle. Atleast 10 explants were cultured for each treatment and the experiments were repeated thrice.

Hardening and acclimatization

Well developed shoots from the above cultures were transferred to half strength MS medium supplemented with different concentrations of IBA, NAA and IAA (0.5 - 2.5 mg/l) for root induction. The regenerated plants were transferred to paper cup containing mixture of sterile soil and manure 2:1 ratio. The plants in paper cups were maintained in the environmental growth chamber (Sanyo, Japan) for acclimatization. Then these plants were transferred to the natural field condition.

Statistical analysis

Thirty cultures were raised for each treatment and each experiment was repeated thrice. Data were regarded after 30 days of culture. Mean values with standard errors were used for a parametric moods median test [23]. The data were analyzed for variance by Duncan's multiple range test (DMRT) using the SAS programme (SAS Institute, Cary, N.C.).

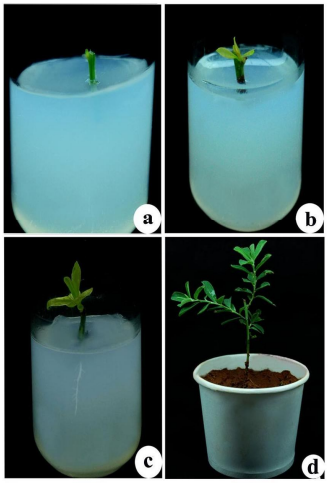
RESULTS AND DISCUSSION

Shoot bud proliferation from shoot tip and nodal explants was observed after 30 days of culture. Shoot tip explant gave better response than the nodal explant. BAP was found to be more effective than KIN and TDZ for shoot multiplication. The number of shoots produced per explant varied with the concentrations of cytokinin (24.5). Among the different concentrations of cytokinins tested highest shoot regeneration frequency (86.88 %) was obtained on MS medium supplemented with 3.0 mg/l of BAP and 15 % coconut water (Table 1; Fig. 1a & b), whereas KIN and TDZ produced one or two shoots. This is the first report of shoot regeneration from the shoot tip explant. Similar observations were reported in other plant species such as *P. amarus* [11], *Phyllanthus amarus* [19], *Vanda coeulea* [24], *Catalpa ovata* [25] and *Phyllanthus urinaria* [26] and from nodal segments of *Vitex negundo* [27]. Elongated and well developed shoots were excised from the shoot clumps and transferred to half strength of MS medium fortified with IAA, IBA and NAA (0.5 - 2.5 mg/l) individually for root initiation. Among the three auxins, highest rooting percentage was observed on IBA (93.2 %) (1.0 mg/l) (Table 2; Fig. 1c). IBA is an important plant growth hormone for the root induction in tissue culture [21]. Well-developed shoots with roots were transferred to paper cups containing sterile soil and manure (2:1 ratio) (Fig. 1d). The plant containing cups were maintained in the environmental growth chamber for acclimatization. Eighty eight percentage of the plantlets were successfully acclimatized and established in soil. Promotary effect of IBA in root formation was also reported in case of *Centella asiatica* [28, 29] and *Acacia sinuate* [30].

CONCLUSION

In conclusion, this study describes an efficient method for direct plant regeneration from shoot tip explant of *P. maderaspatensis* L. This protocol could be used for conservation of this important medicinal plant and also for large scale propagation in the near future. To our knowledge, this is the first report of the successful and established an efficient protocol for high frequency of shoot regeneration of *P. maderaspatensis* L.

Figure 1



a. Shoot induction; b. Shoot elongation; c. Root induction; d. Hardening

Table 1

Effect of various concentrations of BAP, KIN and TDZ with 15 % coconut water on shoot regeneration from shoot tip and nodal explants of *Phyllanthus maderaspatensis* L.

Growth hormones (mg/l)	Shoot tip explant			Nodal explant		
	Percentage of response	Mean no. of shoots /explant	Mean shoot length (cm)	Percentage of response	Mean no. of shoots /explant	Mean shoot length (cm)
BAP						
1.0	76.95^{c}	12.7^{e}	0.6^{ef}	65.48^{d}	12.6^{b}	0.5^{d}
2.0	75.27^{d}	13.3^{d}	1.4^{b}	41.98^{hi}	11.4^{c}	0.6^{c}
3.0	86.88^{a}	24.5^{a}	1.7^{a}	68.70^{c}	13.6^{a}	0.8^{a}
4.0	77.64^{bc}	17.9^{bc}	0.9^{d}	57.85^{e}	10.9^{d}	0.6^{c}
5.0	78.28^{b}	18.9^{b}	0.7^{e}	51.08^{fg}	11.2^{cd}	0.7^{b}
KIN						
1.0	70.32^{i}	12.6^{ef}	0.8^{de}	71.44^{b}	0.3^{i}	0.2^{g}
2.0	71.98^{g}	11.4^{f}	0.7^{e}	77.42^{a}	0.8^{gh}	0.4^{e}
3.0	72.81^{f}	12.9^{de}	1.0^{c}	67.68^{cd}	0.9^{g}	0.5^{d}
4.0	74.96^{de}	16.4^{c}	0.9^{d}	56.02^{ef}	0.7^{h}	0.6^{c}
5.0	70.39^{hi}	11.0^{fe}	0.5^{f}	50.66^{g}	0.6^{hi}	0.7^{b}
TDZ						
1.0	68.58^{j}	1.0^{i}	0.3^{g}	71.29^{bc}	0.8^{gh}	0.7^{b}
2.0	70.54^{h}	1.5^{gh}	0.8^{de}	53.26^{f}	1.6^{e}	0.3^{f}
3.0	72.02^{fg}	1.7^{g}	0.7^{e}	31.44^{j}	1.0^{fg}	0.4^{e}
4.0	69.58^{ij}	1.2^{hi}	0.6^{ef}	44.84^{h}	1.2^{f}	0.5^{d}
5.0	68.55^{ik}	1.4^{h}	0.5^{f}	40.58^{i}	1.3^{ef}	0.6^{c}

Values are calculated as means ± SE of three repeated experiments. Means within a column followed by the same letters not significant at p=0.05according to DMRT

Table 2

Effect of different auxins on root induction from shoot tip explant derived shoots of *Phyllanthus maderaspatensis* L.

Growth hormones (mg/l)	Percentage of response	Mean number of roots / shoot	Mean root length (cm)
IAA			
0.5	62.0^{kl}	4.0^{g}	2.8^{j}
1.0	73.4^{h}	4.4^{de}	4.2^{gh}
1.5	82.6^{cd}	5.6^{b}	5.8^{d}
2.0	74.6^{g}	3.6^{h}	4.8^{f}
2.5	69.6^{i}	2.8^{j}	4.1^{h}
IBA			
0.5	74.4^{gh}	4.6^{d}	5.4^{e}
1.0	93.2^{a}	6.4^{a}	7.5^{a}
1.5	87.4^{b}	4.8^{cd}	6.8^{b}
2.0	84.6^{c}	4.4^{de}	6.1^{c}
2.5	78.8^{e}	4.2^{f}	5.6^{de}
NAA			
0.5	56.0^{l}	2.8^{j}	2.6^{jk}
1.0	63.6^{k}	3.2^{i}	3.8^{i}
1.5	78.4^{ef}	5.0^{c}	4.4^{g}
2.0	68.6^{ij}	3.2^{i}	3.8^{i}
2.5	61.2^{m}	2.4^{k}	2.2^{l}

Values are calculated as means ± SE of three repeated experiments. Means within a column followed by the same letters not significant at p=0.05according to DMRT**.**

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RESEARCH ARTICLE

Land Use/ Land Cover Mapping of Pambar Basin, Central Tamil Nadu, India Using Remote Sensing Data

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ABSTRACT

An attempt has been carried out to map the land use and land cover categories of Pambar basin, using remote sensing data. The total area of the basin is 2599 sq.km. and it is located in the central part of Tamil Nadu. Land use / Land cover map were generated and the areas were categorized into build-up land, agricultural land (crop land, fallow land, agricultural plantation, forest (dense and degraded forests), wastelands, (land with scrub, land without scrub, barren rocky areas) coastal wetlands, back waters, and water bodies on the basis of NRSA classification. Agricultural, wastelands and water bodies were dominant in the present study, which were about 1580 sq.km. (60.75%) 345 sq.km. (13.25%) and 340 sq.km. (13.08%) respectively. The significance of such a study in the formulation of management plans / development plans is also discussed.

Keywords: Land use, Land cover, Remote Sensing, NRSA

INTRODUCTION

Land is the most important natural resources, which embodies soil, water and associated plants and animals constituting total ecosystem. The growing population and human activities are increasingly putting

pressure on the limited land and soil resources for food, energy and several other needs [1] [2]. Comprehensive information on the spatial distribution of land use / land cover categories and the pattern of their change is a prerequisite for planning, utilization and management of the natural resources [3] [4]. Hence, a study of this sort is crucial in formulating the management and development plans.

The information on land use / land cover patterns, their spatial distribution and changes over a time scale are perquisite for making development plans [5-10]. Remote Sensing, the latest advancement in space technology has the capability to overcome the shortcomings of the conventional methods. It makes a major technological breakthrough in the method of acquiring information on land resources, agriculture, forestry, ocean resources and other studies [11] [12]. The present study describes the various land use / land cover categories of the basin.

STUDY AREA

The Pambar basin covers an area of 2,599 sq.km. located in the rain shadow tract of the Sirumalai and Alagar hills. The location of the basin is from 9° 45' to 10° 25' N latitudes and 78° 10' to 79° 00' E longitudes respectively. It spreads in the Districts of Dindigul, Tiruchirappalli, Madurai, Pudukkottai, Sivaganga and Ramanathapuram, which forms a part of semi-arid central Tamil Nadu (Fig. 1). The basin may be classified as hills (west) piedmont zone and plains towards the east. The slope varies from 1 to 70 per cent. Geologically most of rocks fall under Archean group of rocks composed of unclassified biotite gneisses and charnokites, mainly occupies in the parts of the basin. The western portion of the study area is covered by red soil, central portion by alluvium and black soil and coastal areas by coastal alluvium and sandy soils. The semi-arid climatic condition prevails in the study area, temperature reaches its high in the month of May and low in the month of December, with the monthly mean maximum of 34°C, mean minimum of 25.5°C and average mean temperature of 29°C in the month of October. The basin receives an average annual rainfall of 948 mm with significant seasonal variations. The intensity and amount of rainfall are unpredictable during the southwest monsoon period (June to September). The maximum rainfall occurs during the northeast monsoon period (October to December). The period between January and May is the main dry season.

MATERIALS AND METHODS

The study has made use of various primary and secondary data. These include Survey of India (SOI) topographic maps (58 J/3,4,7,8,11,12,16, 58 K/9,13,14,58O/1&2 and 58 N/4 on 1:50,000 scale) and IRS LISS-III Geocoded data of 1:50,000 scale for September - 2001. The Indian Remote Sensing Satellite (IRS) data were visually interpreted by using the image interpretation elements such as tone, texture, shape, pattern, association etc. Adequate field checks were made before ascertaining / finalization of the thematic maps.

Land Use / Land Cover

Remote sensing technology has made significant contribution in the area of land use mapping. The land use / land cover categories of the study area are mapped using IRS ID LISS III data of 1:50,000 scale. The satellite data is visually interpreted and after making a thorough field check, the map is finalized (Fig. 2). The

various land use/ land cover classes, interpreted further the study area include, build-up land, agricultural land (cropland, fallow land, agricultural plantation, forest (dense and degraded forests), wastelands, (land with scrub, land without scrub, barren rocky areas) coastal wetlands, back waters, and water bodies. A detailed account of these land use/ land cover classes of the study area are described in the following section.

RESULTS AND DISCUSSION

a. Built – Up Land

The built-up lands are areas of human habitation developed for non-agricultural uses like building, transport, communication, and utilities in association with water and vegetation lands. These features are identified with their dark bluish green tone in the core and bluish tone on the periphery. They have a typical coarse and molted texture. These areas are also associated with the network of canals, roads, and railway lines.

Five major settlements are distributed randomly in the study area. Karaikudi, an urban centre, is found in the central part, Devakottai in south central part, Nattam in the western part, Thiruppathur near the river course of Manimuthar sub basin in central part and Kallal in the south central part of the region. Few smaller settlements, which represent the minor towns, are mapped and these include Kanadukathan, Pallathur, Kottaiyur, Singampunarai, Kottampattai, Oriyur and Vattanam. The total area covered by the major and minor settlements in the basin constitutes 104sq.km or 4 per cent of the basin area respectively (Table 1).

b. Agricultural Land

These are the lands mainly used for farming and for production of food and other commercial and horticultural crops. With the help of satellite data, it is possible to identify various agricultural land uses up to level II. Various categories of agricultural lands identified in the study area are described below in detail.

i) Crop Land

These include all the agricultural areas identified by their characteristic red tone, regular shaped agricultural fields and in association with settlements, water bodies, etc., The crop lands are found well distributed all along the foot hill zones, plain regions and coastal plain regions of the study area. The kharif crops (paddy, finger millets, groundnut, small millets, pearl millet, sorghum, red gram, black gram, green gram, lab-lab, horse gram, kidney been, castor, gingerly, and sunflower) are cultivated in the months of June, July and August. The rabi crops (paddy, sorghum, maize, black gram, green gram, groundnut, sunflower, gingerly, sugarcane, cotton, chilli and maize) are cultivated in the months of October, November and December. These crops are cultivated throughout the study area and it occupies 804sq.km or (30.9 per cent) of this total study area.

ii) Fallow Land

These are the lands which remain vacant without crop cultivation. These are identified by their dark greenish tone, smaller size, regular shape and medium texture. These fallow lands are found in the central and coastal areas in the study area and in other areas they are scattered. These occupy 299 sq. km. (11.5 per cent) of the study area.

iii) Plantations

Plantation crops such as coconut, mango, sapotta, guava, tamarind, etc., are the major crops cultivated in the basin. Such areas are identified from their dark red tone, medium texture and are found in the foot hills of the upper parts of the study area and in areas near Nattam, Melur, Thiruppathur taluks and the sub basins (river course) of Manimuthar and Pallar. In the coastal area, black wattle is cultivated in Avudaiyarkoil and Thiruvadanai taluks in the study area. Approximately the plantation-cropped areas occupy about 477 sq. km. (18.35 per cent) in the basin.

c. Forest

Forest comprises thick and dense canopy of tall trees. These lands are discerned by their red to dark red tone and varying sizes. They show irregular shape and smooth texture. These forest areas are found on the western part of the basin covering parts of Nattam, Melur, Thiruppathur and Manapparai taluks. The areas under these categories cover about 230sq.km (8.84 per cent).

d. Waste Lands

Waste lands refer to degraded lands, which can be brought under vegetation cover with reasonable effect. Now this land is not under production due to various resources. Different types of waste land category are identified based on their image characteristics like tone, texture pattern, shape, size, location, and association.

i) Land with Scrub

These lands with scrub are generally prone to deterioration and may or may not have scrub cover. The lands under this category are confined to the hills, upland / flat areas and also the fringes of the notified forest boundary. These lands occur as patches stretching from Ponnamaravathy to Thirumayam in the east and from Kunnakudi to Kelasevalpatti in north. They are under this category in about 220 sq.km (8.46 per cent) area of the basin.

ii) Land without Scrub

These lands are found associated with higher topography and are formed by degradation or erosion. It could be identified in the satellite data from its light yellowish tone and its association with the higher altitudes. The absence of vegetation distinguishes this category form the earlier mentioned one. The Western part of the study area covering Nattam, Kottampattai and Thiruppathur taluks fall under this category and these areas occupy about 75 sq.km (2.88 per cent).

iii) Barren Rocky

It is an area of rocky exposure of varying lithology often barren and devoid of soil and vegetation cover. Most of the hill tops and upper slopes of the hillocks that are partially devoid of vegetation are included in this category. In the study area, these lands appear as brownish colour and are irregular in shape. The barren rocky areas cover 4 sq.km (0.15 per cent).

iv) Salt Affected Lands

The salt affected lands are generally characterized as the lands that have adverse affect on the growth of most plants. These occur mainly in inland plains as white patches and are could be easily identified in the image. The area under this category is 43 sq.km (1.65 per cent).

v) Back Water Creeks

Back water creeks are observed in the coastal area. The sea water enters through this open waterway connecting the inland area. The water level in the creek changes with low and high tides. Along these creeks are mudflats are found. This area occupies about 3 sq.km (0.115 per cent).

e. Water Bodies

Water bodies are the areas of impounded water in tanks, reservoirs etc and have regulated flow of water from either rivers or canals. Deep water appears in the satellite imagery as dark blue tone; whereas sallow water appears as light blue tone. The major rivers of the study area are Manimuttar and Pambar. There is no major reservoir as such in the study area. However numerous major and minor tanks are identified. The tanks are found scattered in the entire study area, except the western part of the study area. The area under this category covers 340 sq.km (13.08 per cent).

CONCLUSION

The land use categories of the study area were mapped with the help of IRS data. The land use categories were demarcated as built-up land, agricultural land (crop land, fallow land, agricultural plantation, forest (dense and degraded forests), wastelands, (land with scrub, land without scrub, barren rocky areas) coastal wetlands, back waters, and water bodies.The built-up lands in the study area include towns / minor towns and villages. The total area covered under this land use category is about 104 sq. km. (Table. 1). Among the agricultural lands, it was possible to identify the croplands, fallow lands and plantations. Agricultural areas were found well distributed throughout the study area for the reason that most of the people are engaged in agriculture activities. Total area covered by this land use category is about 1,580 sq.km., out of 2599 sq.km. of the basin. The forests of the study area are confined to the hill slopes of Nattam, Melur and Thiruppathur taluks. The forests occupy about 230 sq.km.

Wasteland categories, such as land with / without shrubs, barren rocky, salt affected lands and backwater creek areas were demarcated. The land with / without shrub were found near Ponnamaravathy, Thirumayam, Kunnakudi, Kelasevalpatti and Kottampattai areas, while the barren rock areas were found in the vicinity of the hilly areas. The salt affected areas were found in the inland plains and backwater creeks are observed in the coastal area. It occupies about an area of 345 sq.km. in the study area. In the water body category, features such as rivers / streams, tanks and reservoirs were delineated. There is no reservoir in the study area however, numerous major and minor tanks are identified some of them are dry. The tanks spread entire study area except in western part of the study area its cover about 340 sq.km. The mapping of land use / land cover is useful for present status of land use analysis, planning and decision-making process.

Table 1: Land Use / Land Cover Classification of Pambar Basin

Sl. No.	Level I	Level II	Area in sq. km.	Percentage of Basin Area
1	Built up land	Built up land	104	4
2	Agricultural land	Crop land	804	30.9
		Fallow land	299	11.5
		Plantations	477	18.35
3	Forest	Dense & Open forest	230	8.84
4	Waste lands	Land with scrub	220	8.46
		Land without scrub	75	2.88
		Barren rocky	4	0.15
		Salt affected land	43	1.65
		Back water creek	3	0.11
5	Water bodies	River/ stream / lake/ tank/ canal	340	13.08
Total			**2599**	**100**

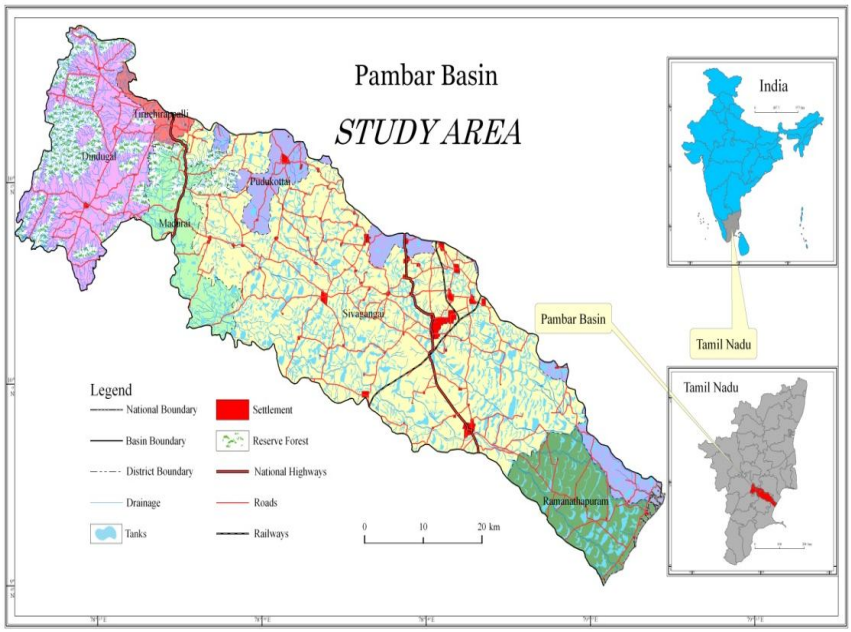

Figure 1: Pambar Basin – Study Area

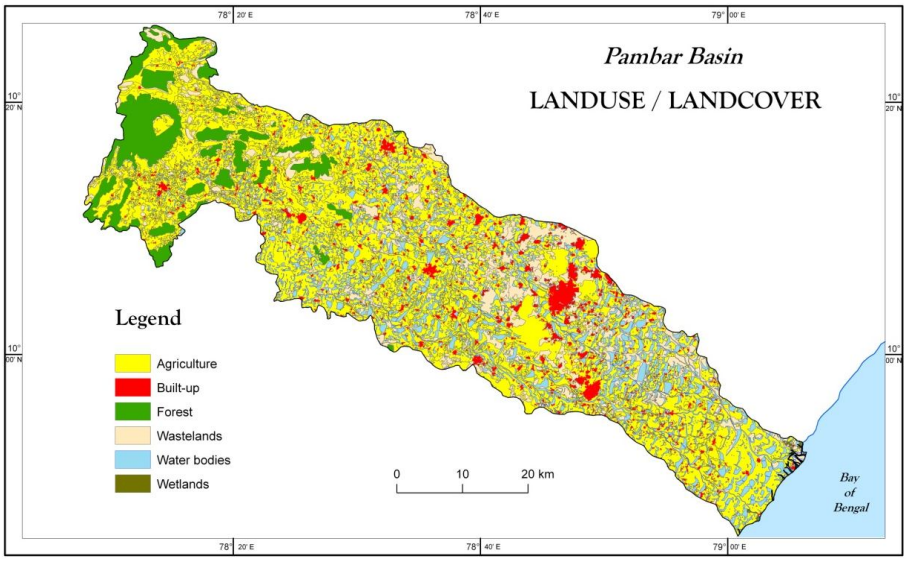

Figure 2: Land Use / Land Cover of Pambar Basin

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RESEARCH ARTICLE

Some Pediatrics Medicines followed by Traditional Birth Attendants

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ABSTRACT

The ancient Tamilians had a vast diversified knowledge in cause and curative effects of diseases. They have one unique medicinal system called Siddha medicine.Siddars, the forefathers of these Siddha medicines. Siddha medicines have developed a unique pattern of medicinal preparation in the name of *Kunapadam.* Pathological methods are explained in *Noi naadal*, Physiological classifications are said in *Udal tattuvam*, Rejuvenative therapy are also said in *Kaya karpham,* Immunomodulatory therapy are described in *Yogasanas & Pranayamas,* Diagnostic methods are said in *Nadi paritchai*. These diagnostic treatment approaches are explained to the layman's cause[3]. Pediatric treatment is explained in *Balavagadam.* It deals with the pathogenesis of fertilization and child development in foetus, and the methods of developing a healthy child. Traditional birth attenders are called by the name of *Dhathis* or *Maruthuvatchi thai (Sevizhi thai)*.They are the sect of women who advise and assist pregnant women for normal birth delivery and guide the post natal mothers to nurture the new born baby by safe and proper methods. According to statistics, 10-15 lakh *Dadhis* (TBA) are found in Indian villages. When they were interviewed in a Tribal area they taught some traditional medicines for Pediatrics'.

Key words: Traditional birth attendants, Pediatric, Herbals

INTRODUCTION

Tamil, the most ancient and prosperous language has originated immemorial and flourished in times of Greek and other dynasties. Tamil culture has been the mother of 64 excellent arts, which are incompatible with the most advanced technologies. Speaking of Tamil medicine (Siddha medicine), the ancient Tamilians had a vast diversified knowledge in cause and curative effects of diseases[2]. Traditional birth attendants are called by the name of Dhathis or Maruthuvatchi thai (Sevizhi thai).They are the sect of women who advise and assist pregnant women for normal birth delivery and guide the post natal mothers to nurture the new born baby by safe and proper methods[8]. According to statistics, 10-15 lakh *Dadhis* (TBA) are found in Indian villages. When they were interviewed in a Tribal area they taught some traditional medicines for Pediatrics'.

Classifications:

They classified Pediatrics' into 2 types. They are

1. Hereditary diseases, 2. Non-adaptive diseases

Hereditary diseases

It is an illness caused by abnormalities in parents. Some examples are Maandham, Kanam, eczema, mouth ulcer, and hyper pigmentation-(In Tamil it is called senkiranthi and karunkiranthi).

Maantham: This is an indigestion problem in children caused by the fermentation of acid in the stomach due to fermentation-Zygomatic diseases.

Senkrandhi: It is the term popularly given to the reddish discoloration of skin on sole and palm which may occur to infants within three month or even immediately. It is marked by hoarse throat, feeble voice (resembling the cry of a cat) eruptions or red syphilitic ulcers and constipation[3]

Karunkiranthi: It is the term popularly given to the blackish discoloration of skin on sole and palm which may occur to infants within three month or even immediately[3].

Maandham disease: It is slugging state of the child, due to the changes in the food pattern of the breast-feeding mother. The mother should avoid buffalo milk items of curd and butter milk, mango, coconut, ground nuts, Lablab bean, fish, bitter gourd and rice paste item[3].

Kanam: If the mandham is not cured properly this may occur from 3-7 years[3].

Non-adaptive diseases

Newborn baby doesn't easily adapt to the surroundings, climatic conditions and other environmental factors. Due to the lack of tolerance to the new scenario the baby develops resistive physiological conditions such as hiccups, vomit and the infant refuse to suck the breast feed[2].

Neo-natal care

Giving sugar water:

Add 10 g of sugar in 30 ml of pure water and few drops should be given in an intermittent period of 6-7 times a day. It is used to excrete meconium (First feces of infants).

Tying *Acorus calamus*:

The roots of vasambu ***(Acorus calamus***) should be cut into small pieces and tied with a piece of cord in the neck and wrist of the baby. Inhaling Acorus's smell stimulates the immunity power of the baby and also safeguards them from stomach pain and vomiting sensation[2].

Tying *Calotrophis gigantea*

The fiber of vellerukku (***Calotrophis gigantea***)[7] tied on the wrist of the baby in order to safeguard them from breathing disorders, such as apnea (difficult to breath), cough and cold.

Oil bath

Gingili oil or coconut oil is applied to the baby. It acts as skin moisturizer and for the toning of the skin.

Applying *Curcuma aromatica*

Curcuma aromatica[7](Kasturi manjal) is applied to the baby skin. Its antiseptic property helps to cure the wound caused at the navel point at the time of childbirth and it prevents infection. It gives shining and smoothening to the skin.

Sunbath

The baby growth is improved by receiving the warm sunrays at the time of sunrise and sunset.

Traditional medicines for certain child diseases

Stomach bloating

Glyceriza glabra root (Adimathuram) is powdered and grinded with fermented rice water and the paste is applied to the baby's stomach.

Ejaculation of milk

One piece of **garlic** is roasted and ***Carum copticum*** (omam) is added to it and fried continuously. To this mixture add 12 ml (1 conch shell) of water and heated until the mixture is concentrated to thickness. Give this decoction one time.

Loss of appetite

Glyceriza glabra root (Adimathuram) is finely grounded with mother's milk. It is applied well around the feeding mother's breast and then the baby is milk fed.

Continuous crying

Clerodendron serratum (siruthekku), ***Pipper longam*** (thippili) are taken in equal quantities and they are powdered, sieved and mixed with ghee. This paste should be applied well around the feeding mother's breast and then the baby will be fed with milk. This process will reduce the crying of the baby.

Hiccups

Glyceriza glabra root (adimathuram) is finely grounded and should be applied well around the feeding mother's breast and then the baby is milk fed[5].

Stomach pain

Calophyllum apetalum (punnaikai), ***Clerodendron serratum*** (kantu parangi), ***Saussaria lappa*** (koshtam) are taken in equal quantities and grinded with water, boiled and applied to the child's stomach.

Urinary disorders

Cucumis sativus seeds are grinded and applied to the child's stomach to reduce the urinary problems.

Senkrandhi

Cow's urine is given one ounce with ***Coleus aromaticus*** **(**omavalli) juice or ***Coleus amboinicus*** (karpura valli) juice or drumstick juice.

(Senkiranthi is the term popularly given to the reddish discoloration of skin on sole and palm which may occur to infants within three month or even immediately.)

Karunkrandhi

6 ml (1/2 conch shell) of Donkey's milk is given continuously for 3 days. (Karunkiranthi is the term popularly given to the blackish discoloration of skin on sole and palm which may occur to infants within three month or even immediately)[6].

Avoiding headache

Pterocarpus marsupium (Udira vengai) tree secretes a red colored resin. This resin is applied on the forehead of the child in order to avoid headache.

***Maandham* disease**

It is slugging state of the child, due to the changes in the food pattern of the breast-feeding mother. The mother should avoid buffalo milk items of curd and butter milk, mango, coconut, ground nuts, fish, Lablab bean, bitter gourd and rice paste items. To cure this disease following treatment should be given:

a. ***Phyla nodiflora (***Poduthalai), ***Morinda tinctoria*** (nuna) leaf, ***Percularia daemia*** (utamani) leaf juices are equally mixed and 3 ml (¼ conch shell) is given for 3 days continuously.
b. ***Phyla nodiflora*** (Poduthalai) leaf is added with salt and concentrated and given in small quantity.
c. Betel leaf stem, ***Acorus calamus*** (vasambu), garlic, ***Pipper longam*** (thipili) are grinded well and boiled with water and given.
d. Besides these ***Phyla nodiflora*** (utamani), ***Morinda tinctoria (***nuna), ***Percularia daemia*** (Uthamani) juices could be given with honey.

***Kanam*:**

If the mandham is not cured properly this may occur from 3-7 years. Treatment to this:

a. ***Aegle marmelos (***vilva) leaf, ***Abutilon indicum (***thuthi) leaf, ***Alium sativum*** (garlic), ***Trigonella foenum graecum*** (vendayam), ***Cuminum cyminum*** (seeragam) are slightly roasted and boiled with little amount of water and decoction is given the child[5].
b. ***Solanum nigram (***manatakkali) leaf, garlic, ***Trigonella foenum graecum (***vendayam) are slightly roasted and boiled with little amount of water and decoction is given the child[5]
c. ***Vitex negundo (***notchi) leaf, ***Ocimum sanctum (***thulasi) leaves, ***Mukia maderaspatana (***musumusukai) leaves are slightly roasted and boiled with little amount of water and 12 ml (1 conch shell) decoction is given the child.
d. ***Evolvulus alsinoides*** (Vishnu kranthi), ***Ocimum sanctum*** (thulsi), ***Pipper longam*** (thipili), mango, Plants parasite (puluruvi) are taken in equal quantities and the decoction is given to the child.

Diarrhea [7]

e. Roots of ***Phyllanthus amarus*** (keela nelli) is grinded with mother's milk and this paste is diluted with water and given for diarrhea due to *Mandham*.

f. ***Phyllanthus emblica (***nellikkai), ***Tamarindus indica*** (puli), ***Citrus medica*** **(**narathai), garlic bulb are taken and boiled with 4 parts of water till it is reduced to 1 part. This concentrated mixture is given for diarrhea caused due to *Kanam*[5].

g. ***Percularia daemia (***veliparuthi) juice is mixed with equal amount of buffalo ghee. Small quantity of ***Nigella sativa (***karum seeragam) is grinded with hot water and mixed with the ghee paste. This mixture is burned well and filtered. One teaspoon of this mixture is given for all types of diarrhea.

h. ***Cuminum cyminum (***seeragam), ***Coriandrum sativum*** (kothamalli), Unripel fruit of ***Punica granatum*** (pomegranate), ***Phyllanthus amarus*** (keela nelli) roots are grinded well and given in morning to cure dysentery.

i. ***Ficus racemosa*** (athi kaai) juice and buffalo curd are taken and mixed with grinded ***Carum copticum*** (omam) and given for diarrhea.

j. Buffalo's ghee, 5 ***Percularia daemia (***veliparuthi) leaf, 5 ***Casia auriculata (***aavarai) leaves, ***Alium sativum*** (garlic) are added and roasted till the leaves are completely fried. The oil is filtered and given with mother's milk,

k. ***Oxalis corniculeta (***pulliarai) juice, ***Musa paradisiaca***(vaazhai poo)flower juice are mixed and given with honey for stopping diarrhea.

Epilepsy disorder

Lungs are affected by sputum and suffocation with the thrusting of the rib bones upwards is the symptom of this disease[4].

Lucas aspera (Thumbai) leaves, ***Ocimum sanctum*** (*thulasi*) leaves, ginger leaves, garlic are grinded and applied to ***Ricinus communis*** (*sitramanakku*) leaves all the leave is gently warmed in mild fire. These leaves are squeezed and the juice is given for this disease.

Jaundice

Phyllanthus amarus (keela nelli) whole plant leaves of ***Solanam nigram*** (*manathakkali*) are given with cow's curd. ***Glyceriza glabra*** root (*Athimathuram*), ***Azima tetracantha*** (sangam) root are mixed in equal quantities and grinded with lemon's juice and given with cow's milk twice a day.

Anaemia

Vitis vinifera dry fruit (ular thiratchai) are soaked in hot water and churned and given.

Cough

Mimosa rubicaulis (Indu) leaves, ***Solanum trilobatum*** (thuthuvalai) ***Solanum surrallense*** (kandankathiri), ***Pipper longam*** (thippipli),***Allium sativum*** (garlic) are finely grounded and boiled with water in earthen container. This concentrated paste is given twice a day[7].

Woophing cough

Juice of ***Solanum trilobatum (***thuthuvalai) and cow's ghee are taken in equal quantities.***Costus speciosus*** (Koshtam) is finely powdered and added to it. This is boiled and in reduced heat and filtered and it is given twice a day.

Vomiting

Punica granatum flowers, sugar, ***Pipper longam*** (thippili) are taken in equal quantities and grinded and given with honey.

Cold and expectorant

Stems of ***Cissus quadrangularis (***pirandai) is roasted in fire and pressed and juice is extracted. This is given with honey to cure cold and expectorant.

Intestinal worms[1]:

Acalipha indica (*Kuppai meni*) leaves are grinded and given 5gms. This should be given in empty stomach at early morning.

By following these traditional medicines from the time of child birth, the diseases could be eradicated easily.It also prevents the reoccurrence of these diseases and thus helps to live a healthy and long life[1].

DISCUSSION

Tamil ancestors they had well knowledge about the nature plants using methods. Nowadays we forgot our traditional ancestor's knowledge slowly. Traditional birth attendants who advise and assist pregnant women for normal birth delivery and guide the post natal mothers to nurture the new born baby by safe and proper methods in natural ways. Present study is undertaken to prove scientifically the curing of the children's diseases by using the Herbal plant in future.

CONCLUSION

Many herbs have been used for the treatment of child health. Not only for the diseased stage also preventive measures. It is clear that herbal medicine system gives healthy life to the generation. In future we should prove this scientifically.

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RESEARCH ARTICLE

Need For Environmental Education

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ABSTRACT

Most of the People are ignorant about the consequences of their waste Management practices on the environment. This can be overcome by promoting environmental education, training and awareness to the people. To increase people participation in waste management and public awareness about the ill effects of irrational waste management practices , to motivate people to develop a positive attitude and play an active role in promoting a cleaner and safer environment. Definitely there will benefits derived by imparting environmental education. We cannot afford to be insensitive and ignorant to the various issues and problems, associated with our environment.

Key words: Environmental education, Household waste management, Vermiculture, Control group & Experimental group.

INTRODUCTION

We cannot afford to be insensitive and ignorant to the various issues and problems, associated with our environment, because if we continue, any more, to remain in ignorance, or, to avoid and ignore environmental problems, these will quickly overrun all of us. Each one of us is now expected to be conscious and have knowledge of environmental issues and be environmentally literate. This has become essential so that the environment which we exploit for satisfaction of our ever increasing needs, requirements, comforts and luxuries of our life, right from our birth till our death, remains fully protected, conserved and enriched.

This will avoid adverse impact of the environment on our health. All this is possible only if these destructive activities are restrained, which can be achieved by and through well planned and effectively managed environmental education programmers, at all levels in rural as well as urban areas. The Government of India too is doing its bit towards promoting environmental education and public awareness. It has adopted the four dimensional strategy which consist of education programmes, research and training programmes, public awareness programmes and environmental information system.

UNEP has laid down the objectives of environmental awareness. They are categorized as:

Awareness: To help social groups and individuals acquire an awareness of and sensitivity towards the total environment and its allied problem.

Knowledge: To help social groups and individuals to gain a variety of experiences and acquire a basic understanding of the environment and it associated problems.

Attitudes: To help social groups and individuals acquire a set of values and feeling of concern for environment and the mobilization for activity, participating in the environmental improvement and protection.

Skills: To help social groups and individuals acquire the skills for identifying and solving environmental problems,

Participation: To provide social groups and individuals with an opportunity to be activity involved at all levels in working towards the reduction of environmental problem (UNESCO/ UNEP, IEEP 1975)

Environmental education is a medium and process of education that covers man's relationship with his natural as well as social and man-made environment, and also it includes the relationship of population, industrialization, pollution, resource allocation and depletion, conservation, transportation, technology, energy and urban and rural planning to the total biosphere. Environmental education should be a lifelong process and should aim At not merely imparting knowledge and understanding of man's total Environment but it should aim at including skills, the attitudes and values Necessary to understand; appreciate and improve our Environment

One of the efficient ways to manage household waste is as follows:

R: Recycle

F: With lots of water, flush in sanitary sewer (NOT a septic tank)
T: Dispose of dried solids in the trash
C: Save for household hazard waste collection

Note:

Solvent-containing products have the words "Flammable," "Combustible," or "Contains petroleum distillates" on the labels.

NEVER mix products containing bleach with those containing ammonia. A toxic gas can form!

The benefits derived by imparting environmental education are four fold:

1. An environmentally educated person understands the scientific concepts and facts that underlie environmental issues and the international ships that shape nature.
2. He/She understands how human society is influencing the environment, as well as the economic, legal, and political mechanisms that provide avenues for addressing issue and situations.
3. He/She explores his/her values in relation to environmental issues; from an understanding of the natural and social One of the efficient ways to manage household waste is as follows :
4. He/She becomes involved in activities to improve, maintain, or restore natural resources & environmental quality for all.

METHODOLOGY

Statement of the Research Problem

To assess the impact of environmental education on household waste management.

Objectives

1. To increase people's participation in waste management.
2. To increase public awareness about the ill effects of irrational waste management practices an environment and human health.
3. To motivate people to develop a positive attitude and play an active note in promoting a cleaner and safer environment.

On the basis of available literature in the field and from the investigator's own observations and experience, the following hypothesis was formulated:

Hypothesis

There is significant difference in the scores between the sample groups of those who have received intervention and those who have not received intervention.

Sample Design

The hypothesis was tested on a sample of 80 households randomly selected from Dombivli. The size of the family had to be at least 3.

The sample design Table 1: distribution of Sample Total House Holds N=80

Tools

The Personal Data Sheet :- A personal data sheet is designed for the purpose of the present study to obtain information about socio-economic and demographic variables like education, occupation, income, size of the family, material possessions and mass media exposure of the sample population.

Scoring pattern

For positive waste management practices the responses were scored as follows:

Regularly	Sometimes	Rarely	Never
4	3	2	1

For negative waste management practices the responses were scored as follows:

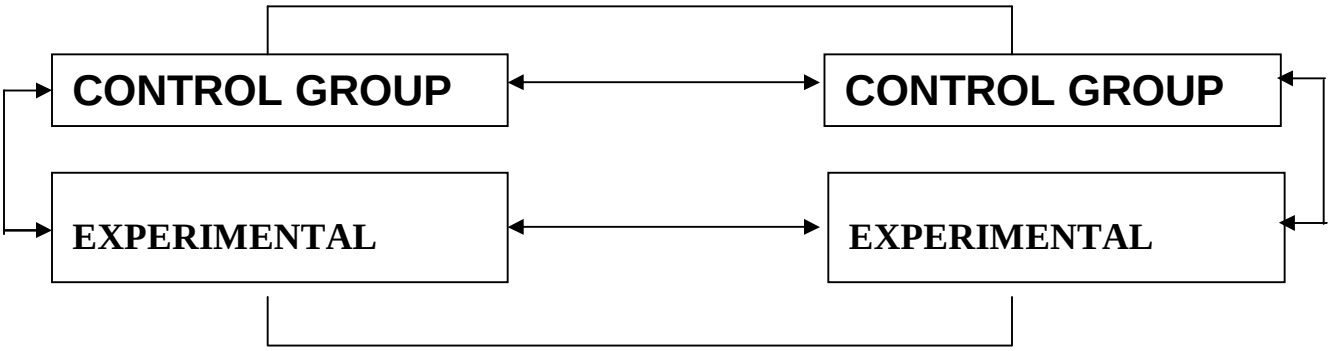
Regularly	Sometimes	Rarely	Never
1	2	3	4

Research Design

The research design for the present study is the pre-test and post-test with control design.

a) Control Group: 40 households of Dombivli are assigned to this group at random.
b) Experimental group: 40 households of Dombivli are assigned to this group at random.

The control group was matched with the experimental group on demographic variables like size of family, occupation, education, exposure to mass media. Subjects were briefed about the purpose of the research and were assured that the data will be kept confidential. The research design of the present study uses two strategies to measure the impact of environmental education on house-hold waste management.The first strategy uses the pre-test and post-test design. In this, the scores obtained on the waste management practices schedule before the intervention is compared with the scores obtained after the intervention is given to the experimental group. The second strategy uses control and experimental group design. The initial scores on the waste management practices schedule is obtained from the control group as well as from the experimental group. Intervention is given only to the experimental group. Again, the scores are obtained on the same waste management practices schedule from the control and experimental groups. If the intervention had any effect it will be reflected in the differences between the final and initial scares of the control and the experimental groups.



Study Design

A period of 40 days was allowed to lapse after the intervention was given. Both the groups were carefully observed to ascertain and verify whether the sample groups actually benefited from the invention and whether they practiced the many techniques of waste segregation, composting, recycling.

Intervention

The intervention or environmental education was a blend of formal lectures, small skits, demonstrations. A printed note "What can you do?" was circulated to the to the house-holds. The intervention was spread over two days. Each day had two sessions. One of 90 minutes each. All the members of every house were present.

RESULTS AND DISCUSSION

Mean, standard Deviations and't' values of waste management practices in both the sample groups

DISCUSSION

Groups	Mean	S.D.	't' Value
Experimental	88.33	12.04	
Control	74.0	14.38	4.19*
* Significant at .01 level			

The results of waste management practices as displayed in the Table 1 reveals that the experimental group and the control group differ significantly in their scores ($t = 4.19$, $p < 0.01$) It indicates that experimental group has been impacted more by the intervention (mean = 88.33) than the contract group (mean = 74.0)This indicates that the experimental group benefited from the environmental education gives to them. They realized that their individual level too they can make positive effects towards salving environmental problems. They become aware that they can gain economical too by recycling various waste and can also present themselves then harmful effects of pollutants by sub stituting them with eco-friendly products. This finding suggests that most of the people are unaware of the damage then are causing to the environment by piling up on waste and dumping it anywhere. When they where educated and made aware that by segregating wet and dry garbage and composting the wet garbage, they keenly adopted the practice. This also suggests that by removing environmental ignorance and frequent environmental education interventions can go a long way in promoting a cleaner and safer environment for all.

These findings are consistent with the hypothesis that there is a significant difference in the scores between the sample groups of those who have received intervention and those who have not received intervention.

CONCLUSION

Most of the people are ignorant about the consequences of their waste management practices on the environment. This can be overcome by promoting environmental education, training and awareness to inculcate consciousness among all categories and age groups of the population. This will bear fruits very soon. Special emphasis should be given to informal education. Practical and live demonstration about recycling products, composting, vermiculture will motivate the public and make them adopt a healthy attitude towards household waste management.

Table 1: distribution of Sample Total House Holds

Automotive	Lawn and Garden	Home Improvement	Household Items
Used motor oil R	Weed Killer C	Latex paint T	Drain and oven cleaner C
Auto Batteries R	Insect Killer C	Oil-based paint C	Toilet cleaner F
Transmission Fluid R	Roach, ant poison C	Stain, varnish, lacquer C	Spot remover **C**
Brake fluid R	Rodent bait C	Paint thinner C	Aerosol Products C
Antifreeze R/F	Bug Spray C	Turpentine C	Empty aerosols T
Gasoline, Fuels C	Fertilizer W/ weed killer C	Furniture stripper C	Rubbing alcohol F
Degreasers C	Fertilizer (no weed Killer) T	Paint remover C	Disinfectant F
Carburetor Cleaner C	Pool chemicals C	Wood preservatives C	Cleaner w/bleach ** F
Windshield washer F	Lighter fluid C	Roofing tar C	Cleaner w/ammonia ** F
		Driveway sealer C	Polish w/solvent * C
		Glue w/solvents C	Glass cleaner F
		Water-based glue C	Mothballs C
		Putty, grout, caulk T	Cosmetics T
		Glaze, spackle T	Nail polish, remover C
		Concrete cleaner C	Empty containers T

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RESEARCH ARTICLE

Urban Trees as Shelter and Livelihood of Human being - an Overview

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ABSTRACT

Trees could play a major role in shaping an environment by their strong influence on the structure of Plant cover, shelter to man, flora and faunal communities. Man for its shade, beauty and economic utility mainly plant an avenue trees. This present study was carried out in the Coimbatore city was between October 2005 and December 2006 with the following primary objectives such as to estimate the preference rate of the urban trees by the local people and to find out the purpose of utilization with reference to species. All trees species were recorded by foot survey. The extent of use of trees by the local people was collected by using "Questionnaire method".A total of 24 urban tree species comprising 456 individuals were recorded in the study area. Human beings got significant benefits from the urban trees through keeping their shops, advertisement boards, coin phone boxes and self employing under the shade. Eleven types of livelihood activities in 54 localities of study area were found under the shade of urban trees. Rupees 26,55,000/-was calculated as an annual income of all livelihood activities together. Among the tree species *Enterolobium saman* (n=10) was extensively used by the local people followed by *Poinciana regia* (n=8) and *Peltophorum inermae* (n=8). Among the livihood activities Cobbler was found under majority of the tree species (n=8) followed by Beggar (n=7) and Tea shop (n=6). Bakery shop was found very low use of urban trees (n=2) than other livelihood activities. On the contrary, it is interesting to note that the income was more for bakery shop keepers than the other livelihood persons.

Key words: flora and fauna, questionnaire, livelihood, tree species.

INTRODUCTION

Trees could play a major role in shaping an environment by their strong influence on the structure of Plant cover, shelter to man, assemblage of the floral and faunal communities. Man for its shade, beauty and economic utility mainly plant an avenue trees, aside from this aesthetic and civic value (**Yahner, 1982).**Vegetation playing an effective role in the urban environment (ecosystem) by supporting many fundamental sub system like hydrological cycles, nutrient cycles, atmospheric gas balance etc. however increasing population and burgeoning urbanization process are converted more and soft green spaces into impermeable hard concrete surfaces. The urban areas experiencing water scarcity, air pollution, heat island etc .

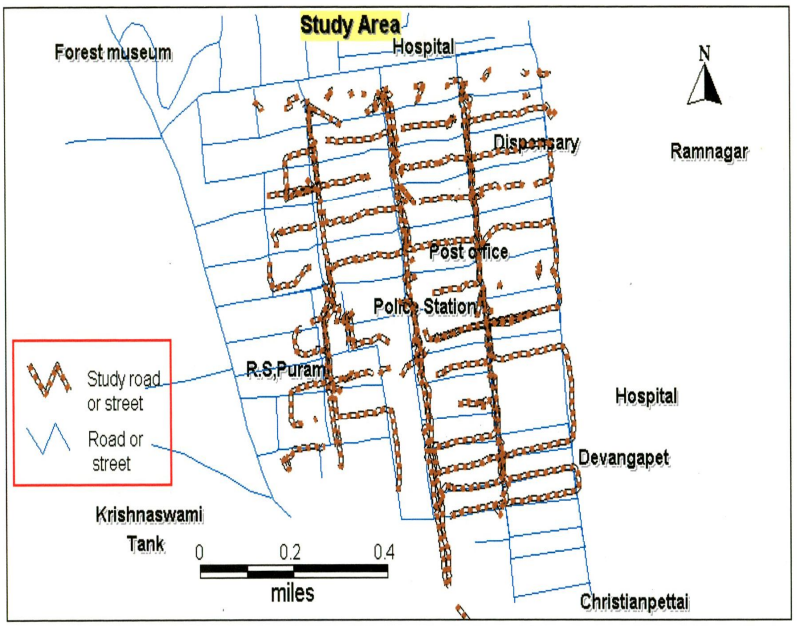
Trees are known to exert a profound influence on microclimates as well as on global climates. The micro-site influence of trees is on temperature, humidity, light conditions and moisture availability. Trees are known to influence global climates by contributing to the formation of CO_2 in the soil system and assimilating the gas from the atmosphere through photosynthesis. The effect on global climate is through their influence on carbon cycle heat transfer and rainfall pattern. Trees also improve the quality of environment by absorbing the hazards of pollution and other form of degradation. Trees absorbs solar radiation and regulates the heat released on the ground **(Thumban, 1994).** Source of emission of green house gas are the respiration of living organisms, smoke from vehicles, emissions from industries etc when the emission of CO_2 outpaces assimilated by trees and other sinks. The potential benefits and uses of N_2 fixing trees and shrubs including final input of the nurse species. Trees are also Source of wood, fuel, fodder and browse, soil improvement increased biological interactions; suppression of weeds and pathogens (Thomas, 1988). **Thumban(1994)** found that tree forming would reduce many green house effect gases significantly.

The atmospheric concentration of gas increases contributing to the phenomenon on double "The green house effect" tree forming to reduce the CO_2 release A wealth of research has been undertaken by the Human-Environment Research Laboratory at the University of Illinois and has identified numerous beneficial effects that trees have on society **(Kuo, 2003).**Many of these social benefits relate to encouraging people out of their homes and into public open space, where they react more with others and build stronger social relationships. An additional benefit of interest is the positive effect that contact with nature can have on children with Attention Deficit Disorder (ADD) (**Taylor, Kuo, Sullivan, 2001).**The awareness of cultivation of medicinal plants within the traditional cropping system help ensuring that multipurpose trees with medicinal values, major parts of the multipurpose trees such as roots, leaves, stem, bark, fruits, seeds, etc. are used for the preparation of medicines.

Azadirachta indica, Dalbergia sisso, Anogeissus species, Terminalia arjuna, Eucalyptus tereticornis, etc. are widely using for preparation of medicines (Rai, et al., 1999).Although use of plants have long been known, uses of urban trees with special reference to the livelihood of human being was not a tempted so far in the state of Tamil Nadu, South India. Considering the lacuna this present study was carried out with the following objectives such as total number of individual species in the selected area, and the benefit to local people of the trees were recorded.

STUDY AREA

The Coimbatore city is not possible to carry out such a short term study for the entire city.The sample area was taken for the study (Rathna Sabapathy Puram) popularly known as R.S. Puram of Coimbatore, which is one of the developed, and the developing areas of the city in Tamilnadu, India. It has a human population of 3,154,296. Coimbatore is an inland district of the southern part of Indian Peninsula, elongates from the north to south between 760 39' and 77degree 56' of east, latitude 10degree12' and 11degree57'of the north longitude. The total extent of area is about 6,024 sq.miles. During the study period the temperature was maximum (30.7°C) in the month of September and minimum (17.2°C) in the month of December. The rainfall was maximum in the month of October (235.1mm) and minimum was in the month of August (50 mm).



MATERIALS AND METHODS

The occurrence of various tree species and total number of individuals were surveyed by foot in the study area. The extent of use of trees by local people for their livelihood was assessed by questionnaire method. Preference rating of each urban tree species by the local people for various livelihood activities was estimated by simple arithmetic calculation. (p) was calculated by utilization (u) divided by the availability

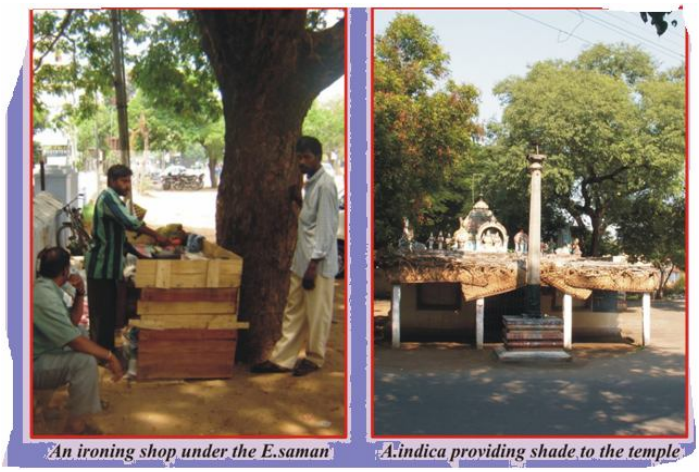
(a). Here p= Preference rating,u= utility and a=Availability.Both closed and open-ended questions were asked to the dependants to express their views freely **(Ramakrishnan *et al*., 1997).**

RESULTS

A total of 24 tree species comprising of 456 individuals were recorded fromthe study area .The family *Leguminosae* attributed more number of individuals(n=303) followed *by Meliaceae(n =40)* and Bignoniaceae(n=33). Among the tree species *Peltophorum inermae* (97), *Poinciana regia* (94) and *Enterlobium saman* (69), were the dominant tree species among the total tree cover.ranked first three positions. On the other hand, species such as *Chlorisia speciosa* (n = 1 *) Eugenia jambolana* (n=10) *Plumeria alba* (n= 1 *) Santalum album* (n = 1) *Pisonia morindifolia* (n= 2) and *Tectona grandis* (n=3) positioned last ranks with their availability being lowest. Species such as *Azadirachta indica* (n= 35) *Cassia fistula* (n= 25) and *Millingtonia hortensis* (n=22) have scored average ranks in the overall vegetation cover (Table - 1).

The preference rating of urban trees by the local people revealed that among the 24 species various peoples used 16 I species were used by people in terms to keeping shops and self employing under the shade of urban trees. Eleven types of livelihood were found under the shade of urban trees and approximately all business together about Rs. 9600 per day(Table- 2)

The income under the shade of urban tress showed that minimum amount of Rs. 50 per day earned under the species of *Poiciana regia* and *Peltophorum inermae* and the maximum of Rs.500 per day under the species *Enterolobium saman*, *Kigelia pinnata* and *Thespesia populinia.* Tea shop and bakery shop keepers were earning more than the other shops.



An ironing shop under the E.saman *A.indica providing shade to the temple*

DISCUSSION

Urban trees are being used by lot of people for their lively hood and other living organisms includes algae, fungi, climbers, amphibians, reptiles, birds and small mammals. Urban trees are probe to be a great value to people living, working, shopping, sharing, walking and motoring in through urban area. Especially human beings got significant benefits from the urban trees by keeping their shops, advertisement boards,

coin telephone phone boxes and other self employments under the shade. This present study found that such eleven types of livelihood activities in 54 localities by using 24 tree species in the Coimbatore city. By using the shade of the trees annual income of rupees 26,55,000/- incurred for the benefit of poor people who living in city to meet out their financial requirements. Although all urban trees were used by the people some of them were extensively used for specified livelihood activities. This is mainly because of the shade availability of the urban trees. In terms of income the location of the tree is very important than the size or spreading ability of the tree .The present study clearly showed that bakery shop and tea shop keepers earning more than the other business. The reason behind would be tea and bakery items are considered to be the essential items. Therefore trees which are located in commercial centres are effectively used for the above purposes. The poor beggars and cobblers were also earning minimum income to meet out their financial requirement under the urban trees.

CONCLUSION

Urban trees play very important role in keeping pollution free environment, increase the aesthetic value, maintain humidity , increase the land value etc., Urban tree greening is an important player in this setting and a decisive element in future town planning and urban resource management. The management of urban green needs a long-term commitment from that area managers of the concern administrators for taking the responsibility for its sustainability, ecologically as well as socially and spiritually.

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RESEARCH ARTICLE

Anti hyperlipidemic Activity of Cocculus hirsutus on Alloxan Induced Diabetic Rats

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ABSTRACT

The aim of this study was to investigate the effects of methanolic extract of cocculus hirsutus leaves for antihyperlipidemic effects in alloxan induced diabetic rats. Its effect was compared with that of glibenclamide, a reference antidiabetic drug. White albino male rats were administered coccullus hirstus (500mg /kg body wt) orally for 30 days. At the end of 30 days, the serum lipid metabolites such as total cholesterol, triglycerides, HDL, LDL, free fatty acid, phovpholipids and lipid peroxides were determined.In order to determine the HDL, LDL, fatty acid, Phospho lipid and lipase content in liver were estimated in control, alloxan, extract treated and glibenclamide treated rats. Oral administration of cocculus hirsutus for 30 days resulted in significant reduction in blood glucose level, lipid profiles of serum and liver of plant treated rats where compared with untreated diabetic rats. The effects produced by the extract were comparable to that of glibenclamide. In conclusion the cocculus hirsutus showed significant antihyperglycemic and antihyperlipidaemic effect in alloxan induced diabetic rats.

Key words: Cocculus hirsutus, antilipidaemic, alloxan, Lipoproteins.

INTRODUCTION

Diabetes Mellitus, a leading non communicable disease with multiple etiologies, affects more than 100 million people worldwide and is considered as one of the five leading causes of death in the world (Zimmet, 1999). The number of diabetic people is expected to rise from present estimate of 150 million to 230 million in 2025 (Iraj et al., 2009). Diabetes mellitus is characterised by an increased concentration of blood glucose due to defects in insulin secretion, insulin action both resulting impaired metabolism of glucose and other energy yielding fuels such as lipids and proteins (Scheen ., 1997). Experimental diabetes in animals has provided considerable insight into the physiological and biochemical derangement of the diabetic state. Many of these derangements have been characterised in hyperglycemic animals. Significant changes in structure and lipid metabolism occurs in diabetes (Sochar et al., 1985). In these cases the structural changes are clearly oxidative in nature and are associated with development of vascular disease in diabetes (Baynes and Thrope., 1999). Liver, an insulin dependent tissue that plays a vital role in glucose and lipid homeostasis and it is severely affected during diabetes (Seifter and England., 1982).

Liver and Kidney participates in the uptake, oxidation and metabolic conversion of free fatty acids, synthesis of cholesterol, phospholipids and triglycerides. During diabetes, a profound alteration in the concentration and composition of lipids occurs. Despite the great strides that have been made in understanding and management of diabetes, the disease and disease related complications are increasing unabated (Tiwari and Madhusudhana ., 2002) Elevated levels of plasma triglycerol and reduced concentration of HDL Cholesterol have been strongly associated with the appearance of small dense LDL particles either in diabetic or non-diabetic individuals (Assumpta et al., 1997). Oxidative stress play an important role in the chronic complication of IDDM. Hyperglycemia is involved in the generation of oxygen free radicals (Lee et al., 2002). Biological oxidants are compounds that protect biological systems against the potentially harmful effects of processes or reactions that can cause excessive oxidations (Krinsky., 1992).

Medicinal plants play an important role in the management of diabetes mellitus especially in developing countries where resources are meager. Many studies have confirmed the benefits of medicined plants with hypoglycemic effects in the management of diabetes mellitus. The effects of these plants may delay the development of diabetic complications and correct the metabolic abnormalities. Moreover, during the past few years some of the new bioactive drugs isolated from hypoglycemic plants showed antidiabetic activity with more efficency than oral hypoglycemic agents used in the clinical theraphy (Bnouham et.al., 2006). More than 400 plants with glucose lowering effect are known (Ernst, 1997). Also a number of plants have a hypolipidemic effect (Sharma et. al., 2003). However there is little information about plants with both hypoglycemic and hypolipidemic effects (Subash Babu et. al., 2006). The present study conclude that cocculus hirsutus leaf extract has potential antihyperglycemic and antihyperlipidemic activity.

MATERIALS AND METHODS

Drugs and Chemicals

Alloxan was purchased from Ponmani Chemical Pvt., Ltd., Trichy. All other chemicals and reagents used were of analytical grade.

Plant Material

The fresh leaves of cocculus hirsutus was collected from perambalur, Tamil Nadu, India. The plant was identified, authenticated and the voucher specimen has been kept in our laboratory for future reference. The leaves were shade dried, powdered and passed through a 40 mesh sieve, and kept in a well closed container for further extraction.

Preparation of plant extract

500g of dried, powdered plant material were extracted successively with methanol using soxhelt apparatus. The residual extract was suspended in water for overnight and filtered. The filtrate was dried and was stored at 4^0C until used. A known volume of the residual extract is suspended in distilled water and was orally administrated to the animals during the experimental period.

Animals

Male albino rats of the wistar strain weighing about 175-210g were used for this study. The rats were 10-12 weeks of age at the time of this study. They were acclimatised to the animal house conditions atleast for one week before carrying out any experimental work. The rats were fed ad libitum with normal pellet (Hindustan Lever Ltd., Bangalore, India) and Water. The experiments were designed and conducted in accordance with the ethical norms approved by ministry of social justice and empowerment, government of India and International Animal ethics committee Guidelines for the investigation of experimental pain conscious animals.

Induction of diabetes mellitus

Diabetes was induced by a single IP injection of 120mg/kg of alloxan monohydrate in sterile saline (Ravivijayavargia et al., 2000). After 72 hours of alloxan injection, the diabetic rats (glucose level >250mg / dL) were separated and used for the study (Perfumi, M and Tacconi, R., 1996).

Experimental design

The method described by Pari and Satheesh (2004) was adopted. In the experiment a total of 30 rats (18 diabetic surviving rats and 12 normal rats) were used. The rats were divided into 5 groups (6 rats / group) after the induction of alloxan - diabetes.

- Group I : Normal untreated rats
- Group II : Normal rats were given CHLEt 500mg/kg body weight in aqueous solution daily for 30 days.
- Group III : Diabetic control
- Group IV : Diabetic rats were given CHLEt 500mg/kg body weight in aqueous solution daily for 30 days.
- Group V : Diabetic rats were given glibenclamide 600µg/kg body weight (Pari and Uma, 1999) in aqueous solution daily for 30 days.

On completion of 30 days of experimental period, the 18 hour fasted rats were anaesthetised and sacrificed by cervical dislocation. Blood was collected with anticoaglulant was used for serum separation.

Biochemical estimation

Blood glucose was determined by the method of sasaki et al., (1972) using O- toluidine reagent. Insulin content was assayed by using RIA Kit (for rats) supplied by Linco Research Inc. (Stat Dianostics, Mumbai). Total Cholesterol was estimated by Parekh and Jung (1970) method. Triglyceride was estimated by the method of Rice (1970). Lipoproteins (HDL and LDL) were fractionated by dual precipitation techniques (Burstein and Scholnick, 1972). Free fatty acid content was estimated by Hron & Menahan (1981) method. Phospholipid was estimated by the method of Bartlette (1959) by digestion with perchloric acid and phosphorus liberated was estimated by the method of Fiske and subbarow (1925). The level of lipid peroxides was asayed by the method of Ohkawa et al., (1979). Lipase activity was determined by kit method (Pointe scientific, inc, USA).

Statistical Analysis

The values are expressed as mean $\pm$ SD for Six rats in each group. All other data were analysed with SPSS/15.0 students software. Hypothesis testing method included one way analysis of variance (ANOVA) followed by post hoc testing performed with least significant difference (LSD) test. The 'P' value of less than 0.05 was considered to indicate statistical significance.

Table-1 Serum glucose, Insulin and Cholesterol content in control and experimental rats in each group.

Groups	Glucose (mg/dl)	Insulin (IU/L)	Cholesterol (mg/dL)
Control	97.22 $\pm$ 1.9	94.6 $\pm$ 0.87	166.7 $\pm$ 5.45
Normal + CHLEt	99.05 $\pm$ 1.6[a]	92.7 $\pm$ 0.61[a]	169.0 $\pm$ 4.70[a]
Diabetic control	257.88 $\pm$ 2.8[b]	59.5 $\pm$ 0.70[b]	345.8 $\pm$ 13.04[b]
Diabetic + CHLEt	106.05 $\pm$ 2.0[c]	91.2 $\pm$ 1.06[c]	209.70 $\pm$ 5.80[c]
Diabetic + glibenclamide	108.26 $\pm$ 3.7[d]	91.81 $\pm$ 3.40[d]	209.40 $\pm$ 8.90[d]

values are given as mean $\pm$ SD of 6 rats from each group. Values are statistically significant * P<0.05.

a Normal + CHLEt rats were compared with normal rats.

b Diabetic rats were compared with normal rats.
c CHLEt treated diabetic rats were compared with diabetic rats and glibenclamide treated diabetic rats.
d Glibenclamide treated diabetic rats were compared with diabetic rats.

Table-1 shows that the amount of glucose insulin and cholesterol in control and experimental group. The amount of glucose and cholesterol was significantly increased and the insulin level was decreased in alloxan induced diabetic rats. However the level of glucose, Insulin and cholesterol was returned to near normal concentrations in diabetic rats treated with CHLEt and glibenclamide.

Table-2 Serum Triglycerides, LDL and HDL level in control and experimental animals.

Groups	Triglycerides (mg/dL)	LDL (mg/dL)	HDL (mg/dL)
Control	104.51 ± 5.31	93.86 ± 7.08	68.40 ± 3.66
Normal + CHLEt	105.03 ± 5.03[a]	94.73 ± 5.04[a]	67.86 ± 4.61[a]
Diabetic control	186.85 ± 4.46[b]	182.11 ± 3.63[b]	21.71 ± 2.11[b]
Diabetic + CHLEt	120.38 ± 3.50[c]	103.96 ± 7.87[c]	64.01 ± 2.44[c]
Diabetic + glibenclamide	115.60 ± 4.22[d]	115.01 ±10.09[d]	68.98 ± 2.91[d]

values are given as mean ± SD of 6 rats from each group. Values are statistically significant * P<0.05.
a Normal + CHLEt rats were compared with normal rats.
b Diabetic rats were compared with normal rats.
c CHLEt treated diabetic rats were compared with diabetic rats and glibenclamide treated diabetic rats.
d Glibenclamide treated diabetic rats were compared with diabetic rats.

The amount of triglycerides and LDL was increased and HDL content was decreased in alloxan induced diabetic rats. However the level of triglycerides, LDL and HDL was revert back in its normal level with the treatment of CHLEt and glibenclamide.

Table-3 Serum Free fatty acids, phospholipid and lipid peroxidation level in the control and experimental group.

Groups	FFA (mg/dL)	Phospholipid (mg/dL)	Lipid peroxidation#
Control	11.03 ± 0.63	161.45 ± 6.38	24.7 ± 4.3
Normal + CHLEt	12.05 ± 0.55[a]	161.7 ± 5.83[a]	22.3 ± 3.1[a]
Diabetic control	24.05 ± 1.1[b]	243.3 ± 9.2[b]	40.9 ± 6.1[b]
Diabetic + CHLEt	14.31 ± 0.66[c]	194.81 ± 4.72[c]	31.2 ± 2.3[c]
Diabetic + glibenclamide	13.68 ± 1.12[d]	189.95 ± 2.79[d]	31.9 ± 5.8[d]

values are given as mean ± SD of 6 rats from each group. Values are statistically significant * P<0.05. # µmoles of MDA liberated / mg protein.

a Normal + CHLEt rats were compared with normal rats.

b Diabetic rats were compared with normal rats.

c CHLEt treated diabetic rats were compared with diabetic rats and glibenclamide treated diabetic rats.

d Glibenclamide treated diabetic rats were compared with diabetic rats.

Table-3 shows that the amount of FFA, Phospholipid and LPO in control and experimental animals. The amount of FFA, Phospholipid and LPO was increased in alloxan induced a diabetic rats. Treatment with CHLEt and glibenclamide to alloxan induced diabetic rats reduces the level of FFA, Phospholipid and LPO.

Table-4 LDL, HDL and FFA content in liver of control and experimental rats.

Groups	LDL (mg/dL)	HDL (mg/dL)	FFA (mg/dL)
Control	68.26 ± 1.4	42.16 ± 1.46	8.38 ± 1.09
Normal + CHLEt	70.43 ± 1.61[a]	41.43 ± 1.05[a]	8.03 ± 0.64[a]
Diabetic control	145.51 ± 1.39[b]	24.9 ± 1.15[b]	4.4 ± 0.56[b]
Diabetic + CHLEt	75.1 ± 1.08[c]	39.63 ± 1.38[c]	7.8 ± 0.81[c]
Diabetic + glibenclamide	73.33 ± 1.26[d]	42.73 ± 1.99[d]	8.38 ± 0.88[d]

values are given as mean ± SD of 6 rats from each group. Values are statistically significant * P<0.05.

a Normal + CHLEt rats were compared with normal rats.

b Diabetic rats were compared with normal rats.

c CHLEt treated diabetic rats were compared with diabetic rats and glibenclamide treated diabetic rats.

d Glibenclamide treated diabetic rats were compared with diabetic rats.

Table-4 shows that the amount of LDL, HDL and FFA in liver of control and experimental rats. The level LDL and FFA were increased and HDL level was decreased in the alloxan induced diabetic rats. Whereas the amount of LDL, FFA and HDL were revert back in its normal level with the treatment of CHLEt and glibenclamide.

Table-5 Phospholipid & Lipase content in the liver of control and experimental rats.

Groups	PHospholipid (mg/dL)	Lipase (IU/L)
Control	166.16 ± 2.02	0.74 ± 0.04
Normal + CHLEt	170.08 ± 2.22[a]	0.75 ± 0.03[a]
Diabetic control	293.05 ± 2.09[b]	0.17 ± 0.02[b]
Diabetic + CHLEt	159.6 ± 4.02[c]	0.70 ± 0.04[c]
Diabetic + glibenclamide	165.35 ± 2.33[d]	0.71 ± 0.02[d]

values are given as mean ± SD of 6 rats from each group. Values are statistically significant * P<0.05.

a Normal + CHLEt rats were compared with normal rats.

b Diabetic rats were compared with normal rats.

c CHLEt treated diabetic rats were compared with diabetic rats and glibenclamide treated diabetic rats.

d Glibenclamide treated diabetic rats were compared with diabetic rats.

Table-5 shows that the level of phospholipid & lipase in the liver of control and experimental rats. Phospholipid content was increased and lipase level was decreased in the alloxan induced diabetic rats. Where as the phospholipid and lipase content was return back its normal level with the treatment of CHLEt and glibenclamide.

DISCUSSION

Hyperglycemia and hyperlipidaemia are important characteristics of diabetes mellitus; an endocrine disorder is one of the most common chronic diseases worldwide. Alloxan, a β-cytotoxin, induces diabetes mellitus by damaging the insulin secreting β-cells of the pancreas, resulting in decreased endogenous insulin release. Alloxan administered rats become hyperglcaemic in a short period of time, followed by hepatic glucose over production. (Milagro and Martinez., 2000). Diabetes is associated with profound alterations in the plasma lipids and lipoprotein profile and with increased risk of coronary heart disease (Betterridge., 2002)

The liver and other some tissues participates in the uptake, oxidation and metabolic conversion of free fatty acids, synthesis of cholesterol and phospholipid secretion of specific classes of plasma proteins (Brown et al., 1993). The aim of the present work is to explore the scientific basis of the utility of the methanolic extract of cocculus hirsutus leaves for correction of hyperglycemia and hyperlipidemia in diabetes mellitus. It was evident from the results that CHLEt reduced the blood glucose level in alloxan induced diabetic rats. The antihyperglycaemic effect of CHLEt could be linked to more than one mechanism. The possible mechanism includes the stimulation of β-cells and subsequent release of insulin and activation of the insulin receptors. The plants antihyperglycaemic action may be by potentiation of pancreatic secretion of insulin, which was clearly evidenced by the increased level of insulin in diabetic rats treated with CHLEt. In this context, a number of other plants have also been reported to have antihyperglycemic and insulin release stimulatory effect (Kaleem et al.,2006)

An increase in serum cholesterol, triglycerides and LDL were observed in alloxan induced diabetic rats, but in CHLEt treated alloxan induced rats there is a reduction of cholestrol, triglycerides and LDL. These reductions could be beneficial in preventing diabetic complications as well as improving lipid metabolism in diabetes (Cho et al., 2002). The level of HDL and FFA in serum was decreased in alloxan induced diabetic rats and these levels were increased with the treatment of CHLEt. Rajagopal and Sasikala (2008) reported that HDL and FFA were increased with the treatment of Nymphaea Stellata in alloxan induced diabetic rats. The marker hyperlipidemia that characterises the diabetic state may therefore be regarded as a consequence

of the uninhibited action of lipolytic hormones on the fat depots. (al - Shamaony et. al., 1994). Excess of fatty acids in plasma produced by alloxan promotes the liver conversion of some fatty acids to phospholipids and cholestrol. These two substances, along with excess of TG formed in the liver, may be discharged into lipoproteins in the blood (Bopanna et al., 1997).

Phospholipid and lipid peroxidation in serum was increased in alloxan induced diabetic rats. Whereas these levels were decreased in the treatment with CHLEt. The important factor determining the level and composition of serum and tissue lipids is LPO associated with cellular membrane studies have reported an increase in hepatic, MDA concentration in STZ induced diabetic rats when compared with the normal rats (Vaiyapuri et al., 2008)

The liver lipid profiles like LDL, HDL, FFA, Phospholipids and lipase content were changed in the alloxan induced diabetic rats, where as the treatment with CHLEt to alloxan induced diabetic rats shows marked changes as shown in Table 4 and 5. In this context, activation of hormone sensitive lipase (HSL) during insulin deficiency is accompanied by enhanced release of free fatty acids in the plasma produced by the STZ - induced diabetes promotes the conversion of excess fatty acids into phospholipids and cholesterol in the liver, may be discharged into the blood in the form of lipoproteins (Bopanna et al., 1997).

It can be concluded from the data, CHLEt significantly reduces the levels of serum and tissue lipids, which are actively raised in alloxan diabetes rats. CHLEt has beneficial effect on plasma insulin. However its antihyperlipidemic effect could represent a protective mechanism against the development of atherosclerosis.

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SPECIAL ARTICLE

Household Waste Management

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ABSTRACT

In India 50-66 % of waste poses a potential Hazard to Human health or the Environment when improperly treated, Stored, Transported, Disposed of, or otherwise managed. Waste management refers to a care fully organized system In which waste go through appropriate path ways to there ultimate alienation or disposal in ways that protect Human health and the Environment.

Key words: Waste Minimization, Household Chemicals Vermiculture, Composition Household Waste

INTRODUCTION

Until recently, the disposal of waste didn't attract much attention. From prehistory through the present day, the favored means of disposal was simply to dump solid waste outside of the city or village limits. Frequently, these dumps were in a wet land adjacent to river or a lake. To minimize the volume of the waste, the dump was often burned. This method of waste disposal was state of the art till recently. As better waste – disposal technologies were developed & as values changed, more emphasis was placed on the

environment & quality of people. Simply dumping & burning our wastes is no longer an acceptable practice from an environmental or health perspective.

The concepts of dilute and dispense, concentrate and contain have become inadequate. However, containment was and is not always achieved. Containers, whether landfills or drums, natural or artificial, may leak or break and allow waste to escape.We are facing a serious waste disposal problem. The problem results because we are producing too much waste and there is to little acceptable space for permanent disposal. Waste disposal sites are necessary if society is to function smoothly. However, no on wants to live near a waste disposal site, be it a sanitary landfill for municipal waste, an incinerator that burns urban waste or a hazardous waste disposal operation for chemical materials.

In India 50-66 percent of waste poses a potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Waste management refers to a carefully organized system in which wastes go through appropriate pathways to their ultimate elimination or disposal in ways that protect human health and the environment. Many of the present waste management programmes include simply moving waste from one site to another and not really managing it. Waste from Urban areas is placed in landfills, but these cause new problems if they produce methane gas or noxious liquids that leak from the site and contaminate the surrounding areas. Disposal sites produce significant air pollution problems. The sewage treatment plants too produce air pollutants some of which are carcinogenic.

The simplest way to deal with wastes is to not produce them in the first place. The pollution prevention hierarchy stresses reductions in the amount of hazardous waste produced by employing different strategies

First – reduce the amount of pollution at the source.
Second – recycle wastes wherever possible.
Third – treat wastes to reduce their hazard or volume.
Fourth – dispose of wastes on land or incinerate them as a last resort.

Collection of municipal wastes is the first step in the management of solid waste pollution. In India domestic solid waste substances are generally thrown by the residents in specially enclosed masonry structures on road sides, on the roads, in the corners of the building or behind the boundary walls. Even the residents of flats in multi-storied buildings throw their domestic wastes downward which come as 'missiles' on the ground while dusts and ashes spread in the air. These heaps of municipal garbage are spread by stray cattle, pigs, rats, rodents and rag-pickers who collect some reusable items such as iron and aluminum junks, paper and plastics. These heaps of solid wastes are then collected by municipal personnel and carried by trucks and Lorries to dump sites. The collection and clearance of municipal wastes from various collection sites are not performed regularly in most times. The frequency of waste collection should be increased and properly maintained. The garbage should be collected by municipal personnel at least twice a day from the market and at least once a day from residential areas.

The second step of the solid waste management is the proper and scientific method of disposal of solid wastes. Garbage disposal involves (i) sorting of waste substances, (ii) dumping of non-combustible substances into suitable dump sites and (iii) incineration of combustible substances. The solid wastes are

sorted into the following categories of substances - i) Compostable organic matter, ii) non-combustible solid wastes. iii) highly combustible waste (eg. Papers, card boards, plastics, rubber) , iv) combustible wastes (eg. wood scrap, cartons, floor sweepings) and v) animal and vegetable wastes and reusable wastes.

Composting is a biochemical process in which organic materials such as lawn Chippings and kitchen scarps decompose to a rich soil like material. It is a process of rapid, partial decomposition of moist, solid, organic waste by aerobic organisms. For this it is necessary to separate organic material from other waste. Compostable organic substances such as vegetables, plant leaves, flowers which are bio degradable substances should be composted either through open window composting method or through mechanical composting method and thus useful manure can be produced. Composting solves twin problems i.e. proper disposal of solid wastes and production of organic manure for increasing agricultural input. A town with one lakh population may produce 20,000 tonnes of garbage and 8,000 tonnes of night soils which can be converted into 18,000 tonnes of compost per year (J.Singh & D. N. Singh, 1988).

Non-combustible solid wastes such as metals and bottles can be sold to scrap dealers and recycled. Combustible substances may be burnt in specially designed incinerators in absence of oxygen. Most incineration facilities burn unprocessed waste. Incinerators drastically reduce the amount of waste – up to 90 percent by volume & 75 percent by weight, Primary risks of incineration, however, involve air – quality problems & the toxicity & disposal of the ash. Incineration is also more costly than landfills in most situations. When cities are unable to dispose of their trash locally in a landfill & must begin to transport the trash to distant sites, incinerators become more cost effective.

Modern society uses many different kinds of chemicals. A typical household yields the following inorganic chemicals :

Table 1 :Typical Household Chemicals

Common name	Chemical Name	Use
Table Salt	Sodium Chloride	Flavour
Saltpeter	Potassium nitrate	Preservative
Banking soda	Sodium bicarbonate	Leavening agent
Ammonia	Ammonia	Disinfectant
Bleach	Sodium hypochlorite	Bleaching
Lye	Sodium hydroxide	Drain cleaner

Vermiculture is another way of managing bio-degradable waste efficiently. It can be done by following these steps :

1. Collect organic waste material like cloth paper, left-out vegetable waste, leaves etc. except glass, plastic, steel etc.
2. Cut the organic waste into small pieces and add cow dung.
3. Decompose the same in container or plastic bag.
4. Transfer it into vermin-casting chamber. See that no rats, ants, lizards etc enter the chamber.

5. Release the earthworms (at least 100 earthworms) in the garbage.
6. After two or three days turn the garbage up and down to make space for the earthworms to move around. Sprinkle little water every day to keep it moist.
7. After three weeks the product will be a mixture of unutilized and utilized material. The unutilized material is the garbage not consumed by the earthworms yet. The utilized material will be in the form of granules (like tea powder)
8. Strain this out with the help of a sieve.
9. After two weeks separate the solid and power (granules) form the non-granule material.
10. Stop sprinkling water on the granules. Keep it dry as it becomes easier to strain. Avoid moisture. When semi-dry strain the mixture.
11. Precautions to be taken – Avoid entry of ants, rats and lizards, which can harm the earthworms. To avoid ants sprinkle turmeric powder.
12. For this vermiculture project the species of earthworm to be taken is "E N G I N E E".

On an individual level, we can all attempt to reduce the amount of waste we generate. Every small personal commitment from each of us could have the cumulative result of a significant reduction in waste management. In Mumbai 7500 tonnes of garbage is produced daily. Nearly 1000-1500 tonnes of it is dumped into storm drains.The Supreme Court passed a ruling in 2000 about separate disposal of wet and dry garbage. It made the use of covered bins for garbage compulsory. The ruling stated that the bins have to be centrally located at junctions that are accessible by the dumper trucks. The solid waste management department estimates that the cost of garbage disposal amounts to Rs. 120 per resident per year. This cost to the government can be saved if all of us take care to consume or buy only as much as we need and recycle the waste wherever possible. The composition of house-hold waste likely to end up at a disposal site within Kalyan Dombivli Municipal Corporation limits is : 39 percent plastic, 10 percent others, 7 percent glass, 9 percent food waste, 7 percent metals, 9 percent paper and 19 percent hard waste.

CONCLUSION

An innovation and environmentally sound idea is to consider wastes to be resources out of place. The increasing cost of raw materials, energy, transportation and land make it economically viable to reuse and recycle more resources. This means there really is no such thing as waste, only resources.As the problems of household waste and its management arises at the individual level, the solution must be sought at the same level. The keys are awareness, environmental education about the problems of unsafe, unsanitary dumping and the alternatives available.

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Introduction - Shall start immediately after the Abstract, as the next paragraph, but should be typed in double-space. The Introduction should lead the reader to the importance of the study; tie-up published literature with the aims of the study and clearly states the rationale behind the investigation.

Materials and Methods - Shall start as a continuation to introduction on the same page. All important materials used along with their source shall be mentioned. The main methods used shall be briefly described, citing references. Trivial details may be avoided. New methods or substantially modified methods may be described in sufficient detail. The statistical method and the level of significance chosen shall be clearly stated.

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Articles in Journals

1. Devi KV, Pai RS. Antiretrovirals: Need for an Effective Drug Delivery. Indian J Pharm Sci 2006;68:1-6. List the first six contributors followed by *et al*.
2. Volume with supplement: Shen HM, Zhang QF. Risk assessment of nickel carcinogenicity and occupational lung cancer. Environ Health Perspect 1994; 102 Suppl 1:275-82.
3. Issue with supplement: Payne DK, Sullivan MD, Massie MJ. Women's psychological reactions to breast cancer. Semin Oncol 1996;23(1, Suppl 2):89-97.

Books and other Monographs

4. Personal author(s): Ringsven MK, Bond D. Gerontology and leadership skills for nurses. 2nd ed. Albany (NY): Delmar Publishers; 1996.
5. Editor(s), compiler(s) as author: Norman IJ, Redfern SJ, editors. Mental health care for elderly people. New York: Churchill Livingstone; 1996.
6. Chapter in a book: Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. p. 465-78.

Illustrations: Tables - Should be typed on separate sheets of paper and should not preferably contain any molecular structures. Only MS word table format should be used for preparing tables. Tables should show lines separating columns but not those separating rows except for the top row that shows column captions. Tables should be numbered consecutively in Arabic numerals and bear a brief title in capital letters normal face. Units of measurement should be abbreviated and placed below the column headings. Column headings or captions shall be in bold face. It is essential that all tables have legends, which explain the contents of the table. Tables should not be very large that they run more than one A4 sized page. Tables should not be prepared in the landscape format, i. e. tables that are prepared width wise on the paper.

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