*IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)*
*e-ISSN: 2278-3008. Volume 5, Issue 2 (Jan. – Feb. 2013), PP 36-42*
*www.iosrjournals.org*

# "Medicinal Plants from the Landfill Site of Doon Valley"

Seema Manwal[1] and Dr. S.P. Joshi[2]
*Ecology Research Laboratory, Botany Deptt., D.A.V.(P.G.) College, Dehra Dun*

***Abstract:*** *Solid Waste generation and its disposal to safer sites are posing a threat to environment and human existence. Due to poor solid waste management practices, problems of health, sanitation and environmental degradation are unavoidable.*

*In the current paper we have tried to assess the total Municipal Solid Waste (MSW) generated in Doon Valley and its disposal to landfill site along with the plant species that grow on this site.*

*116 plant species were recorded growing in landfill site. They included 2 tree species, 4 shrub species and remaining herb species. These included many invasive species like Lantana camara, Eupatorium adenophorum, Ageratum conyzoides and Parthenium hysterophorus.*

*The plants are best source to remediate the solid wastes and this technique is Phytoremediation. However, it is a slow process but certainly cost effective.*

***Keywords:*** *Phytoremediation, solid waste, Nagar Nigam, Landfill, MSW*

## I. Introduction

The term "solid waste" usually refers to waste that is solid, including semi liquid or wet wastes with insufficient moisture or fluid content to be free flowing (CPCB, 2000). "Municipal solid waste" (MSW) is a heterogeneous mixture of various constituents. The term refers to all waste collected by a local authority or municipality and comprise of waste from different sources. It includes commercial and residential waste generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated biomedical waste.

The uncontrolled decomposition of organic constituents of waste results in various environmental problems (NEERI, 1995). The problem of Municipal solid waste is as old as civilization itself. With rapid urbanization and industrial revolution, the problem began to grow more serious. The problems grow more complicated with arrival of non- biodegradable plastic containers, polythene wrappers etc. The disposal of garbage is one of the most irritating problems for urban communities. The quantity of waste is high in India due to higher density of population. With rapid and unplanned urbanization, multifarious health and environmental problems are compounded.

## II. Study Site

The study was carried out in 2008 at municipal landfill site located in Dehradun, India. Municipal Landfill site of Dehradun is located on the Sahastradhara Road (Fig.1). Sahastradhara is located near outer Himlaya's foot hill on the north of Doon Valley. Sahastradhara, literally means, the 'thousand fold spring' is situated at a distance of 11 Kms from Dehradun. The place is an ideal picnic spot and is of immense attraction to visitors.

Study site is located in 30° 20'53" north latitudes and 78° 04'69" east longitudes. At an altitude of 720 meter (2362 ft.) above near sea level. The Baldi River and the caves provide a breathtaking view. The landfill site covers the 4.5 acre area. Landfill site is approximately flat with gentle slope of North to South direction.

## III. Methodology

MSW Landfill site was surveyed exhaustively throughout the study period. Each visit to the site concentrated on the plant species growing during different seasons. The collected specimens were processed, preserved and mounted on herbarium sheets. The field data on habit, habitat, and flower colour, etc. was recorded in a field notebook.

Specimens were identified from BSD, DD Herbaria, both at DehraDun. Identified plants are deposited in DDN (Herbarium of Botany Department, D.A.V. (P.G.) College, DehraDun).

## IV. Observations And Results

Municipal Corporation of Dehra Dun collects MSW on daily basis generated by a population <2, 70,000 from an area of approximately 37.17 Sq. Km. Total waste generated per day is 67.54 metric tones. The MSW of the entire city is dumped in only one landfill site of approximately 4.5 acre (Table 1). The landfill site

is Trenching Ground type located on a cultivable wasteland on Sahastradhara Road. The landfill site is on a North to South gentle slope.

General composition of MSW of D. Dun is similar to MSW of class I and II Cities. It has maximum contribution (<40% by weight) from vegetable leaves & stones (Fig. 2). It also includes categories like paper, plastic, glass, ceramics, metal and other miscellaneous categories.

A total of 116 plants species belonging to 45 families were recorded (Table 2). Dicots contributed maximum (81%) at species level. Herbs dominated the site over other growth forms. Poaceae, Cucurbitaceae, Asterceae and Solanaceae emerged as dominant families of the site. Castor (*Ricinus communis)* an oil yielding plant grew well and formed bushy patches at many locations of the landfill. Seedlings and saplings of *Mangifera indica, Bombax ceiba, Dalbergia sissoo, Melia azaderach* and *Aegle Marmelos* were also recorded with stunted growth.

A maximum 65% of the total biodiversity was recorded in herbaceous form (Table 3). Climbers/ Twiners and seedlings and saplings of Trees were represented by 11 species and 13 species respectively. Only 10 shrubs species were recorded during the entire study. 30 species recorded from the landfill site fall under cultivated plants category with 26 species as dicots and only 4 species as monocots (Table 4). Wild plants species identified from the site included 68 dicots and 18 monocots. Thus, the diversity of landfill flora has 79% wild dicots and 77% cultivated dicots.

## Medicinal Plants

Medicinal plants are observed growing on landfill. They provide a clue for commerce along with rehabilitation measures. Medicinal plants found on Landfill site of Doon Valley are as below:

| S.No. | Botanical Name | Vernacular Name | Family | Medicinal Use | Medicinal part of use |
|---|---|---|---|---|---|
| 1 | ***Amaranthus spinosa*** | Maras | Amaranthaceae | Poultice for broken bones, astringent, diaphoretic, diuretic, emollient and febrifuge. Internally in the treatment of internal bleeding, diarrhoea and excessive menstruation. Snake bites, Externally, used to treat ulcerated mouths, vaginal discharges, nosebleeds and wounds. menorrhagia, gonorrhoea, eczema and colic | Plant, Seed, Leaves, root |
| 2 | ***Achyranthes aspera*** | Chirchita/ Latzira | Amaranthaceae | Asthma, specific for spleen enlargement, cholera, cough, renal dropsy, excessive menstrual bleeding, stomach disorders like stomach ache, piles and bowel complaints, diarrhea and dysentery, useful in cuts and wounds, for clearing warts and ulcers | Leaves, ash of the herb, root |
| 3 | ***Solanum nigrum*** | Makoya | Solanaceae | effective in the treatment of digestive disorders, flatulence, colitis and peptic ulcers, dysentery, asthma, dropsy, increases the secretion and discharge of urine, fever, chronic skin diseases, useful applicant over corrosive ulcers, pustules and suppurating syphilitic ulcers, severe burns, herpes and rheumatic joints, ringworms, corrosive ulcers and tumors, used to wash tumors and inflamed, irritated and painful parts or the body | Leaves, plant, green fruit |

| | | | | | |
|---|---|---|---|---|---|
| 4 | ***Solanum xanthocarpum*** | Katehli | Solanaceae | Carminative, expectorant, decongestant | Leaves Seeds Root |
| 5 | ***Momordica charantia*** | Karela | Cucurbitaceae | Diabetes, cancer, viral infections, and immune disorders, cytostatic effects in breast cancer | Leaves and fruits |
| 6 | ***Aegle marmilos*** | Bael | Rutaceae | diarrhoea and dysentery, dyspepsia,fever, ophthalmia, allay urinary troubles, useful in the disordes of *vata*, *pitta* and *kapha* | Leaves, Fruit, roots, bark |
| 7 | ***Murraya paniculata*** | Kamini/ kadipatta | Rutaceae | decongestant diaphoretic | Leaves |
| 8 | ***Citrus limon*** | Nimbu | Rutaceae | Antiseptic, antirheumatic, antibacterial, antioxidant, febrifuge | fruit and the essential oil |
| 9 | ***Canabis sativa*** | Bhang | Cannabinaceae | Analgesic, Anodyne, Anthelmintic, Antibacterial, Antiperiodic, Antispasmodic, Cancer, Cholagogue, Demulcent; Diuretic, Emmenagogue, Emollient, Febrifuge, Hypnotic, Laxative, Narcotic, Ophthalmic, Sedative, Tonic. wide range of conditions including alcohol withdrawal, anthrax, asthma, blood poisoning, bronchitis, burns, catarrh, childbirth, convulsions, coughs, cystitis, delirium, depression, diarrhoea, dysentery, dysmenorrhoea, epilepsy, fever, gonorrhoea, gout, inflammation, insomnia, jaundice, lockjaw, malaria, mania, menorrhagia, migraine, morphine withdrawal, neuralgia, palsy, rheumatism, scalds, snakebite, swellings, tetanus, toothache, uteral prolapse, and whooping cough | Plants, leaves and seed |
| 10 | ***Sesamum indicum*** | Til | Pedaliaceae | Hypoglycemic, liver tonic, tinnituses, remedy galactagogue | Seeds, Seed oil, Root |
| 11 | ***Ricinus communis*** | Arandi | Euphorbiaceae | Laxative, purgative | Seeds, Seed oil |
| 12 | ***Euphorbia hirta*** | Dudhi ghas | Euphorbiaceae | Antispasmodic, antiasthmatic, bronchiolytic, sedative, expectorant | Aerial parts |
| 13 | ***Ocimum sanctum*** | Tulsi | Lamiaceae | Hypoglycemic, antispasmodic, analgesic, hypotensive, febrifuge, adaptogenic, anti-inflammatory | Aerial parts |
| 14 | ***Argemone maxicana*** | Rusa | Papaveraceae | Plant is diuretic. Purgative and destroys worms, It cures | Roots, leaves, seeds and |

| | | | | | |
|---|---|---|---|---|---|
| | | | | lepsory, skin-diseases, inflammations, bilious fevers, ophthalmia and opacity of cornea | yellow juice. |
| 15 | ***Milia azedarach*** | Bakayan | Miliaceae | Leprosy, scrofula, anthelmintic, antilithic, diuretic, deobstruent, resolvent. resolvent, deobstruent. Rheumatism. Burns, Gingivitis (Inflamed bleeding gums) Gonorrhea: Piles (Bleeding), Pyrexia | Leaves, Root Seeds, bark |
| 16 | ***Delonex regia*** | Gulmohar | Caesalpinieaceae | Antibacterial properties | fruits |
| 17 | ***Tamarindus imdica*** | Imli | Caesalpinieaceae | The anti-snake venom properties, Tamarind pulp is useful in treating fevers, bilious vomiting, flatulence and indigestion | Fruit pulp, seed, leaves |
| 18 | ***Ageratum conyzoides*** | Jangli pudina | Asteraceae | relieves pain, spasms and inflammation, kills bacteria and insects, relaxes muscles, heals wounds, fights free radicals, prevents ulcers, reduces fever, cleanses blood, stops bleeding, stimulates digestion, reduces mucus, expels gas | Whole Plant |
| 19 | ***Catharanthus roseus*** | Sadabahar | Apocynaceae | menorrhagia and rheumatism, diabetes , malaria, tuberculosis | Leaves, flower, stalks, whole plant |
| 20 | ***Calotropis procera*** | Aak/Aakha | Asclepidaceae | relieves strangury, cures ulcers, acts as an expectorant, relieve stomach pain, flower is a tonic, appetiser, stomachic, that cures piles, asthma and wounds, useful in cholera | Leaves, flower |
| 21 | ***Adhatoda vasica*** | Safed Bansa | Acanthaceae | Plant used extensively for treating cold, cough, chronic bronchitis and asthma, used as sedative, expectorant and antispasmodic. Relieve asthma and nervous disability, diarrhea and dysentery, useful in haemoptysis and rheumatic pains | leaves |
| 22 | ***Opuntia*** | Nagphani | Cactaceae | irritable bowel relief, prostate reducer | Flowers, Fruit, Stems |
| 23 | ***Cleome viscosa*** | Jakhiya/ pasugandha/ hulhul | Capparaceae | Plant pacifies vitiated kapha, intestinal worms, colic, stomach upset, cardio myopathy, diarrhea, fever and dyspepsia | Whole plant |
| 24 | ***Sida cordifolia*** | Kharenti | Malvaceae | Bronchial asthma, cold & flu, headache, nasal congestion, aching joints, and cough, wheezing, | Aerial part |

| | | | | | |
|---|---|---|---|---|---|
| | | | | dysentery, inflammation, piles, rheumatism, etc. It is also used by bodybuilders and athletes for superior performance and leaner bodies as it is helpful in fat loss, diaphoretic, diuretic, stimulating to the central nervous system and anti-asthmatic | |

## V. Discussion

A floral diversity of 116 plant species in an area of 4.5 acres of landfill site species richness. The dominance of wild species (86) species over cultivated (30 species) is a good signal for phytoremediation measures. Presence of oil yielding Castor plant in good number opens up avenues for both short listing of species selected for rehabilitation process and to evaluate the ecological requirements of plants.

Presence of seedlings and saplings of many tree species may appear interesting at one glance but the stunted and deformed growth indicates their vulnerability to the prevailing environmental factors. Medicinal plants, like *Adhatoda vasica, Achyranthes aspera, Calotropis procera, Ocimum sanctum, Aegle marmelos, Vitex negundo* and *Catharanthus roseus* are observed growing on landfill. They also provide a clue for commerce along with rehabilitation measures. Among the invasive exotic species occurring vigorously in adjoining area only *Lantana camara* and *Ageratum conyzoides* were recorded in moderate numbers. *Parthenium hysterophorus* and *Eupatorium odoratum* were completely absent from the landfill site, however, they are very vigorous in adjoining areas.

In the present study, Poaceae, Cucurbitaceae, Asterceae and Solanaceae emerged as dominant families. Maurice *et. al.* (1995) while working in the landfills of Sweden recorded Poaceae, Asterceae, Polygonaceae and Chenopodiaceae as dominant family. In the plants growing on landfill site, some plants showed symptoms of Chlorosis that led to their death. This was probably due to lack of $O_2$ that would have been replaced by $CO_2$ and methane, abundant gases in MSW landfill.

## VI. Conclusion

The present study on plant diversity in landfill site concludes a good number of species (116) growing in relatively in small area (4.5 acre). Among the species commercially important species like *Ricinus communis, Achyranthes aspera, Calotropis procera* provide a chance for revenue generation along with phytoremediation. The absence of invasive species like *Eupatorium odoratum* and *Parthenium hystrophorus* from the landfill site further provide a hope for utilizing this site to grow economically viable species.

## Acknowledgement

We are grateful to the Head, Department of Botany, D.A.V. (P.G.) College, Dehra Dun for providing required facilities.

## References

[1] C. Maurice, A. Bergman, H. Ecke and A. Lagerkvist, 1995, Vegetation as a biological indicator for landfill gas emissions. Initial investigations. Proceedings of Sardinia '95, Fifth International Landfill symposium, S. Margherita di Pula, Italy, 2-6 October, 1995.

[2] CPCB, 2000, Status of Municipal Solid Waste Generation, Collection Treatment, and Disposal in Class 1 Cities, Central Pollution Control Board, Ministry of Environment and Forests, Government of India, New Delhi.

[3] NEERI, 1995, 'Strategy Paper on SWM in India', National Environmental Engineering Research Institute, Nagpur.

**Table 1: Characteristics of Municipal Solid Waste (MSW), its generation and Landfill Site at Dehradun.**

| **Characteristics** | |
|---|---|
| Population of Dehradun City (Census 2001) | 270159 |
| Area of Dehradun City | 37.17 Sq. Km. |
| Local Body Concerning MSW disposal | Nagar Nigam, Dehradun |
| Total Waste Quantity generated | 67.54 MT/day |
| Number of Landfill site | 1 |
| Area of Landfill site | 4.50 acre |
| Topography of Landfill Site | A wasteland on northern periphery adjoining Sahastradhara Road. Site is approximately flat with gentle slope of North to South direction. |
| Category of Landfill Site | Trenching Ground |

**Table 2: Angiospermic diversity in various categories of taxa at MSW landfill site of Dehradun**.

| S.No. | Rank of Taxa | | Number | Percentage (%) |
|---|---|---|---|---|
| 1 | Family | Dicot | 41 | 91.10 |
| | | Monocot | 04 | 8.90 |
| 2 | Genera | Dicot | 82 | 82 |
| | | Monocot | 18 | 18 |
| 3 | Species | Dicot | 94 | 81.03 |
| | | Monocot | 22 | 18.97 |

**Table 3: Growth habit of plant diversity at landfill site of MSW in Doon Valley.**

| S.No. | Habit | Number | Percentage (%) |
|---|---|---|---|
| 1. | Climber | 11 | 9.48 |
| 2. | Herb | 76 | 65.51 |
| 3. | Shrub | 10 | 8.62 |
| 4. | Trees (Seedlings & Saplings) | 13 | 11.20 |
| 5. | Undershrub | 06 | 5.17 |

**Table 4: Variation in composition of cultivated and wild species at MSW landfill site in Doon Valley.**

| Category | | Number | Percentage (%) |
|---|---|---|---|
| Cultivated | Monocot | 04 | 13.33 |
| | Dicot | 26 | 76.66 |
| Wild | Monocot | 18 | 20.93 |
| | Dicot | 68 | 79.06 |

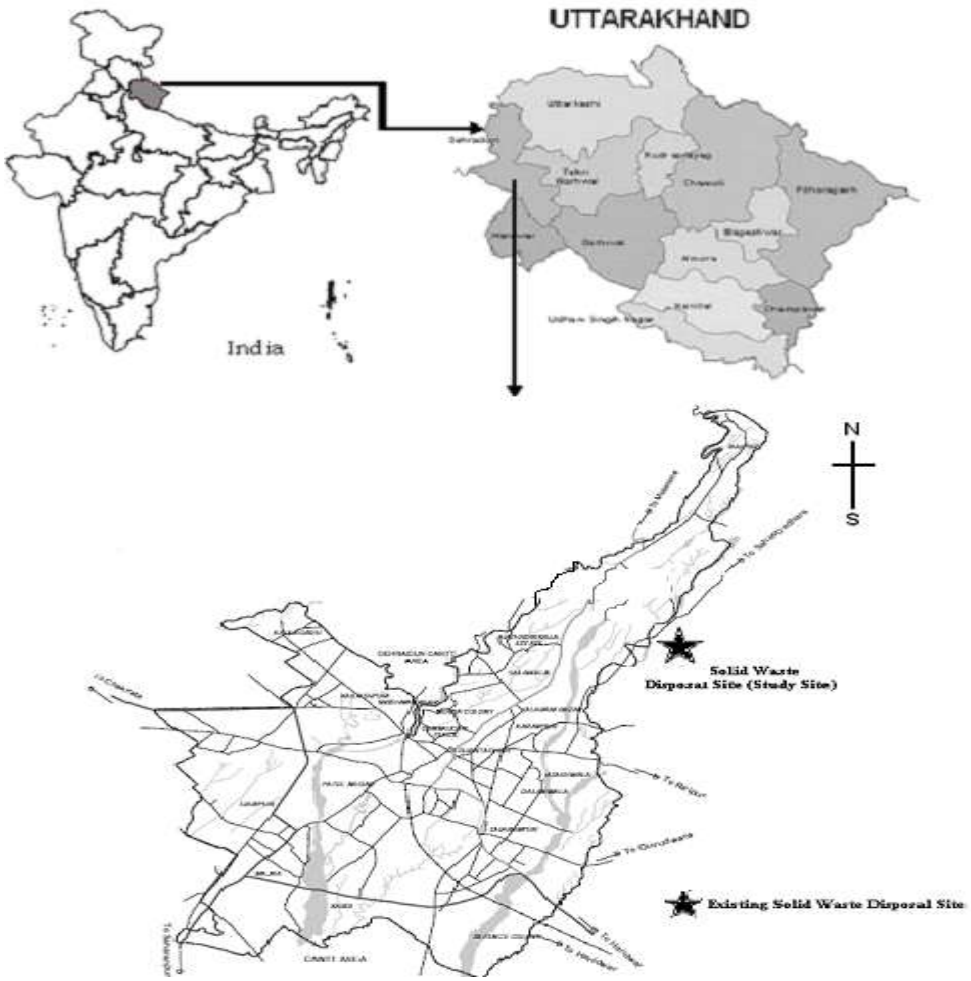


**Figure 1: Map showing MSW Landfill site.**

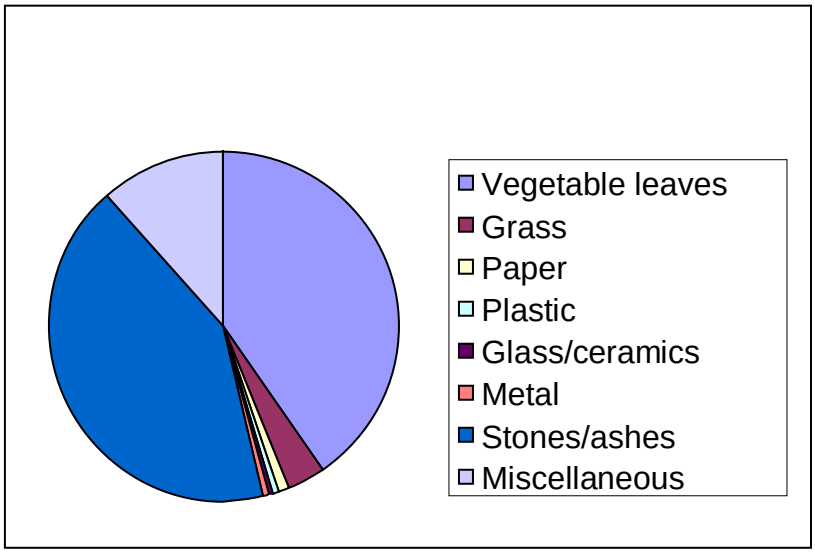


**Figure 2: General Composition of MSW of Dehradun**.