



Science Society of India

Abstract Book

A collection of project abstracts sent to I-SWEEEP by SSI

This book contains the award details, photographs and abstract of the projects that was sent to I-SWEEEP, USA by Science Society of India (SSI) from 2010 to 2012.

SSI is a registered non profit trust created among others for promoting scientific acumen among the people of India.

SSI has been sending participants to the Fair during the last 3 years.

Year	Number of Projects sent	Results
2012	2	1 Gold (for Vidya Venkatesh & Khyati Sood from Mumbai) 1 Bronze (for Karthik Bhat & Ramnath Rao from Puttur, Karnataka)
2011	3	2 Bronze (for Shireen Jaiswal from Nagpur, Athira Nair from Mandya, Karnataka) 1 Hon. Mention (for Ekta Patel & Pankit Gami from Surat)
2010	3	1 Silver (for Shireen Jaiswal from Nagpur) 1 Bronze (for Vishnu Jayaprakash from Chennai) 1 Hon. Mention (for Hetal & Ankur Patel from Rajkot)

Performance of Indian Team at I-SWEEEP

2012



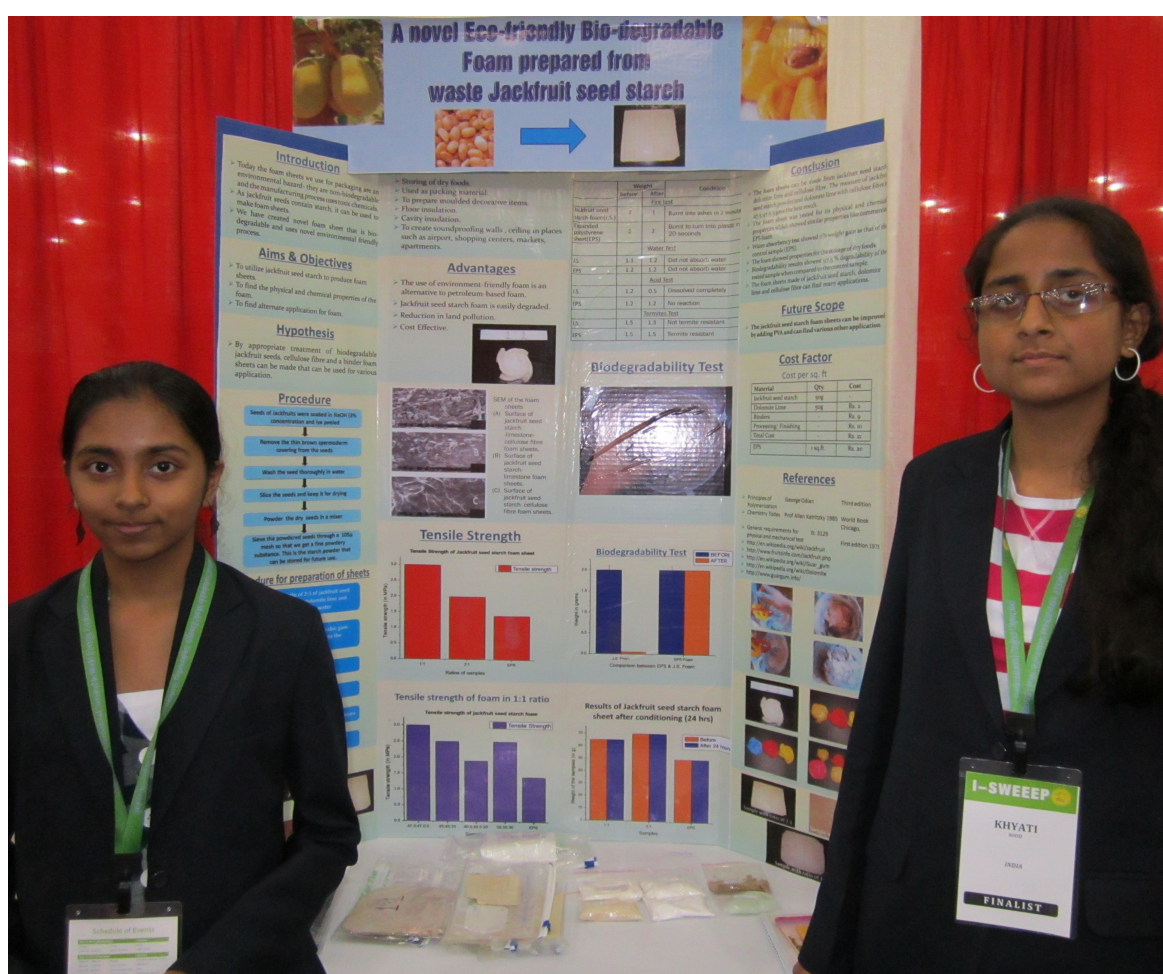
From Left: Karthik Bhat, Khyati Sood, Vidya Venkatesh and Ramnath Rao

Sent Two Projects

Awards Won: 1 Gold medal & 1 Bronze medal

A novel eco-friendly biodegradable foam sheet prepared from waste jackfruit seed starch

By: Vidya Venkatesh & Khyati Sood
School: Modern English School, Mumbai
Maharashtra
Category: Environment
Award Won: Gold medal



Vidya Venkatesh & Khyati Sood at I-SWEEP 2012

TITLE: A novel eco-friendly biodegradable foam sheet prepared from waste jackfruit seed starch

Vidya V. and Khyati Sood, Modern English School, Mumbai, Maharashtra

Abstract:

We have made biodegradable foam sheets from jack fruit seed starch that could replace commonly used expanded polystyrene (EPS) foam sheets. The product and the process both are novel and turn a waste product into an environmentally friendly packaging/insulation material.

Synthetic foams such as EPS are widely used for packaging and insulation, but their hydrophobic nature impedes microbial action and therefore, such materials take hundreds of years to decompose.

There is hence an intense effort to seek biodegradable replacements that can be easily degraded into simpler compounds that can be metabolized by micro-organisms once the product is discarded in the environment.

We have made biodegradable foam sheets from jack fruit seed (a waste product) starch, dolomite lime and cellulose fibres. The composite formulation of cellulose fibre was investigated using 5g, 10g, 20g, and 30g of fibres. The jackfruit seed starch and dolomite lime was taken in varying ratio of 1:1 and 2:1. Guar gum was added to avoid settling of materials and magnesium stearate to facilitate removal of foam.

The procedure that was followed involved making the foam sheets by taking cellulose fibre and stirring it continuously for 4 minutes. Jack fruit seed starch and dolomite lime were added. Guar gum and magnesium stearate were added and stirred for 5 minutes. The mixture was pressed in a screw jack press with uniform pressure and heat for 3 minutes.

Sample of foam sheets made with a ratio of 47.5:47.5:5 showed the best result.

All the samples were tested for physical and chemical properties and compared with a control EPS sample. Water absorbency showed 0% weight gain, and an acid test indicated that the jack fruit seed starch foam dissolved in acidic media unlike the control sample (EPS) which did not dissolve. Fire test showed that the jackfruit seed starch foam burnt and turned into ash after 2 minutes.

Biodegradability test showed the jackfruit seed starch foam sheet degraded up to 97.5% unlike the EPS which did not degrade.

The tests for physical and chemical properties indicated that jack fruit seed starch foam sheet can be used as a biodegradable substitute for the existing synthetic foam sheets.



A novel Anti Termite treatment & control using schleicheria oleosa leaves

By: Karthik Bhat & Ramnath Rao
School: Ramkrishna Vidyalaya, Puttur,
Karnataka
Category: Environment

Award Won: Bronze medal



Karthik Bhat and Ramnath Rao Bekal at I-SWEEP 2012

TITLE: A NOVEL ANTI TERMITE TREATMENT & CONTROL USING SCHLEICHERA OLEOSA LEAVES

Karthik Bhat A, Ramnath Rao Bekal, Sri Ramakrishna High School, Puttur, Karnataka

Abstract:

In this project we have prepared an eco-friendly natural bio-termicide from *Schleichera oleosa* leaves and demonstrated its termicidal efficiency. Termites cause a lot of damage to the buildings. Synthetic termicides like Deviban cause damage to environment. *Schleichera oleosa* is a tree that grows in Western Ghats region of India, and has traditionally been used for as building wood. According to the traditional knowledge, *Schleichera oleosa* is not attacked by termites. However, no analysis of insect repellent or cidal properties of *Schleichera oleosa* has been done till now. So, we decided to scientifically investigate the termicidal properties of *Schleichera oleosa* and prepare a bio-pesticide from it.



0.5 kg of *Schleichera oleosa* leaves are crushed and homogenized with 2 litres of distilled water and heated at 95°C for 20 minutes. Then it is filtered and cooled. Thus 1 litre of the termicide is prepared. This extract is used as it is without dilution.

Proper Viscosity, Surface Tension and pH of the extract is maintained. With our natural termicide the mortality rate was found to be 80%. We did more than 20 tests on termites. We are able to kill or inactivate 200 termites of 2 sq m area within 1 hour. We are also able to repel red ants with the same extract.

The FTIR spectroscopy test of the extract showed the presence of Carbonyl (CO) and hydroxyl (OH) groups. We have sent our extract to an external research laboratory (at Mangalore University) to check for mammalian toxicity.

Thus we have carried out a systematic study of *Schleichera oleosa* insecticidal behavior and prepared eco-friendly Termicide which can be used both indoors and outdoors.

2011



From Left: Athira Nair, Ekta Patel and Shireen Jaiswal at I-SWEEP 2011

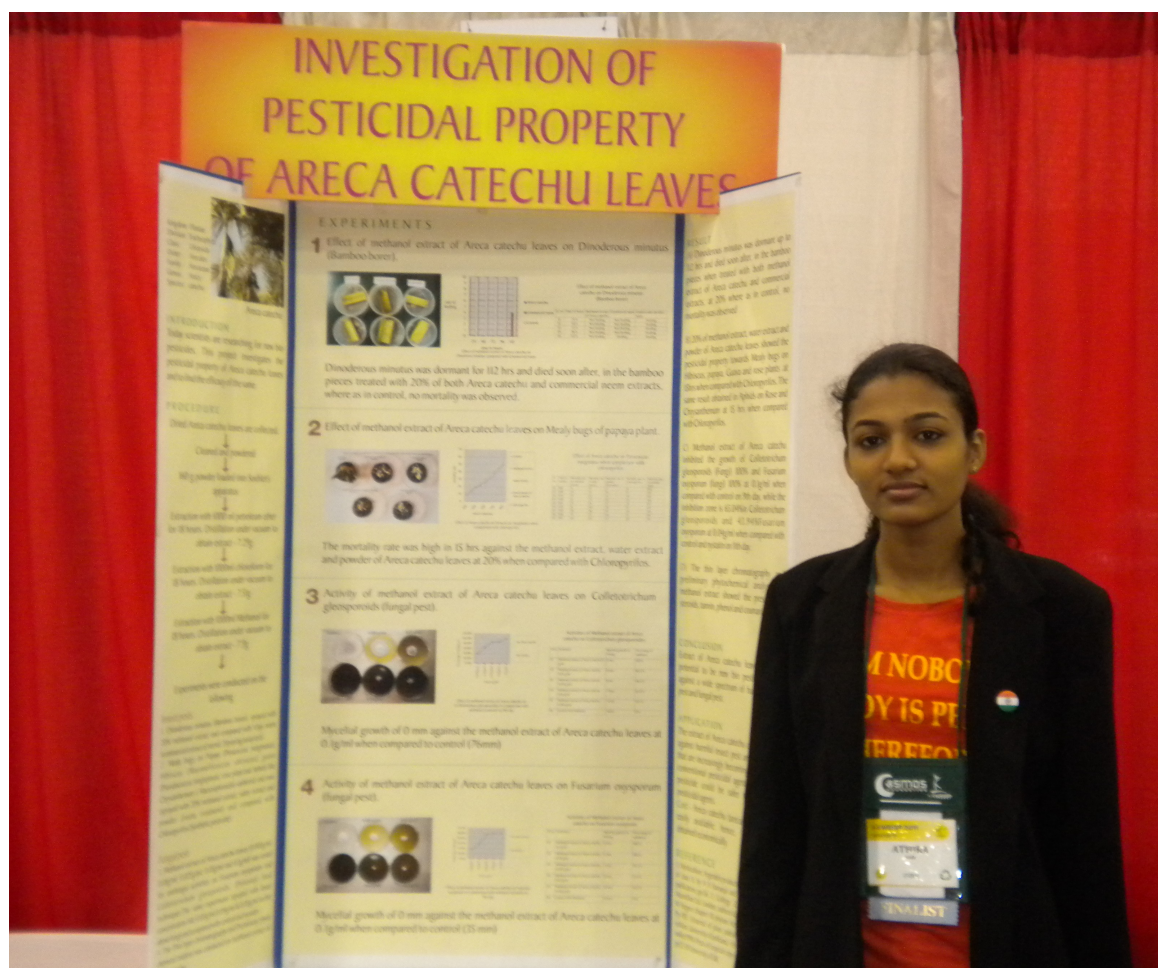
Sent Three Projects

Awards Won: 2 Bronze medals & 1 Hon. Mention

Investigation of pesticidal property of Areca Catechu leaves

By: Athira Nair
School: Jawahar Navodaya Vidyalaya, Mandya, Karnataka
Category: Environment

Award Won: Bronze medal



Athira Nair at I-SWEEEP 2011

TITLE: INVESTIGATION OF PESTICIDAL PROPERTY OF ARECA CATECHU LEAVES

Athira Mohandas Nair, Jawahar Navodaya Vidyalaya, Mandya District, Karnataka

Abstract:

Today scientists are researching for new herbal pesticides. This project investigates the pesticidal property of Areca catechu leaves and to find the efficacy of the same. In ayurveda (traditional Indian medicine), these leaves are known to have curative properties for human and animal lice.

Dried leaves of Areca catechu were collected, cleaned, powdered and methanol extraction was done.

Experiments were conducted on Dinoderous minutes (Bamboo borer), Mealy bugs on Papaya (*Paracoccus marginatus*), guava (*Pseudococcus longispinus*), Hibiscus (*Maconellicoccus hirsutus*), Rose and Aphids on rose (*Macrosiphum rosae*) and Chrysanthemum (*Macrosiphoniella sanborni*) with (insitu treatment) using 20% methanol extract, water extract and powder of Areca catechu leaves.

Experiments were conducted on fungi like *Colletotrichum gleosporoids* and *Fusarium oxysporum* by poisoned technique at 5000ppm, 10,000ppm, 25000ppm, 50,000ppm, 75,000ppm & 1, 00000.

Comparative study revealed that insect like Dinoderous minutes sprayed with 20% methanol extract of Areca catechu leaves mortality rate after 112hrs is 100% when compared with commercial neem (0%) and control (0%). Mealy bugs and Aphids showed 100% mortality rate in 15hrs when compared with Chloropyrifos (Synthetic pesticide) 90% and control 0 %

Similarly fungi like *Colletotrichum gleosporoids* and *Fusarium oxysporum* were inhibited by 100% when compared to control and use of fungicide nystatin (42.2% in *Fusarium oxysporum* and 79.1% in *Colletotrichum gleosporoids*)

The TLC test done at Central Government Laboratory shows significant presence of ingredients like phenols,steroids,tannin and coumarin, which are found in many other pesticides.

These experiments demonstrate that Areca catechu extracts exhibit strong pesticidal properties and has the potential of being used as a herbal pesticide in the near future.



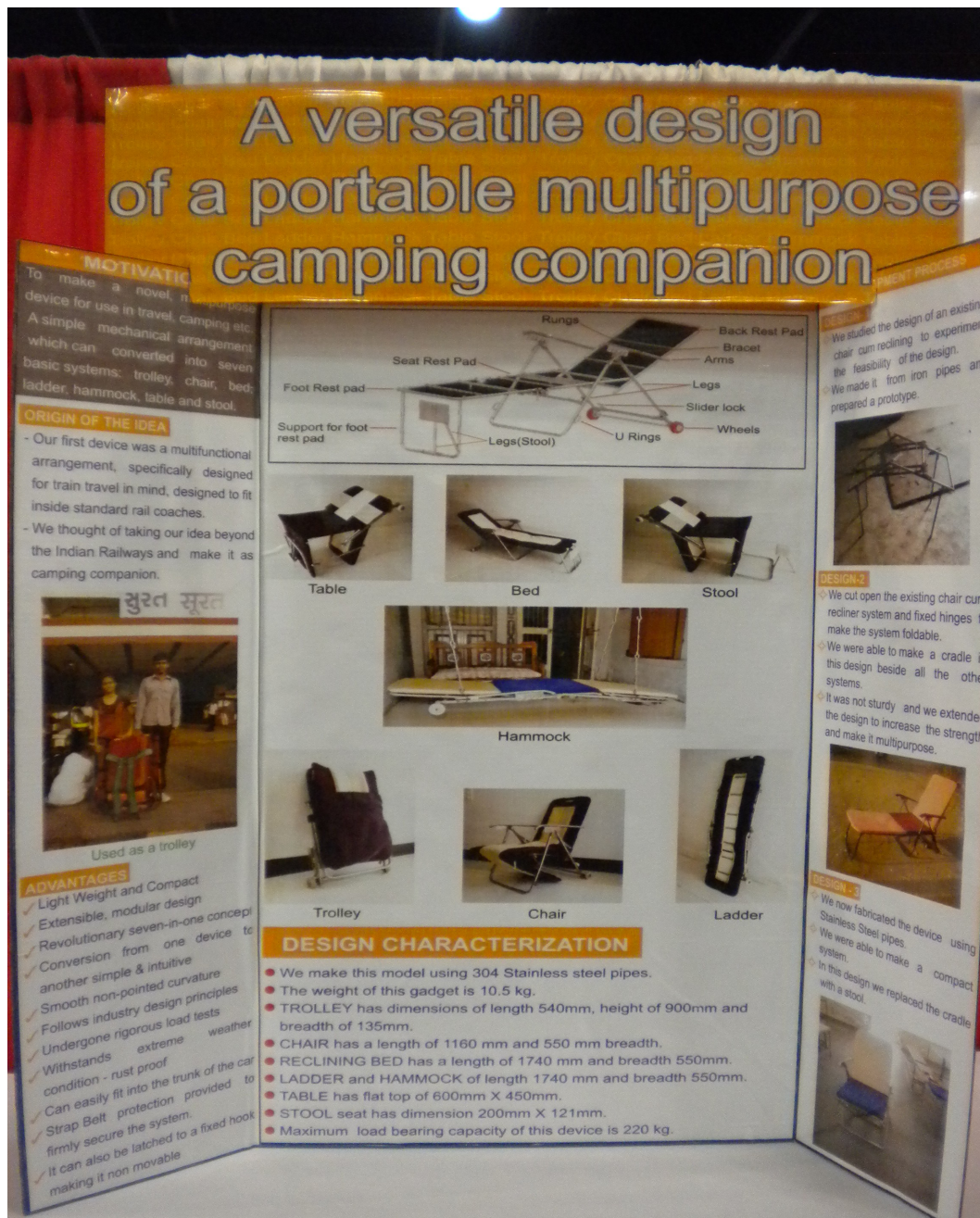
A versatile design of portable, multipurpose camping companion

By: Ekta Patel & Pankit Gami

School: Jawahar Navodaya Vidyalaya, Tapi
Gujarat

Category: Engineering

Award Won: Hon. Mention



Project Display of Ekta Patel & Pankit Gami at I-SWEEP 2011

TITLE: A versatile design of portable, multipurpose camping companion

Ekta Patel and Pankit Gami, Jawahar Navodaya Vidyalaya Tapi, Gujarat INDIA

Abstract:

Our project consists of design of versatile portable camping companion utility. This seven in one device can be made into a trolley, chair, reclining bed, ladder, hammock, table and a cradle. It can be used during outdoor activities like camping or picnicking.

We began our experimentation with a prototype made in iron bars which had six basic parts the back rest pad, the seat rest pad, the foot rest pad, the support of the foot rest pad, arms and legs. We found that we were able to make it multipurpose by converting it from one type to another. Hence we made the second design with A class iron pipe.



In this second design apart from the five basic system we added four brackets one on each arm and one on each of the longer legs. When the device is fully closed it is in the form of trolley with the wheels attached to the longer leg. When opened it becomes a chair and when arm is placed in the last slot of the bracket and the foot rest pad is lifted up it and the support of the foot rest pad is lowered it becomes a reclining bed. By removing the arms and pushing the legs the entire structure becomes straight and when the slider lock locks the structure, it serves as ladder and as a hammock when tied with ropes. When the seat rest pad is raised and the back rest pad and the foot rest pad is lowered it serves as a table. When the table is inverted and the back rest pad and the foot rest pad are brought closer to each other and tied with an S shaped hook it serves as a cradle.

In the third prototype we have made the device from 304 stainless steel pipes for its long life and modified the design too. In this we attached the back rest pad and seat pad by using link. We joined the back rest pad and handle by riveting it. We joined the foot rest pad and seat rest pad by using connector made of stainless steel knob and also had a hinge to connect them. We joined the foot rest pad and support for foot rest pad with rivet. The two legs are joined together with a knob and hinge. A slider connects the back rest pad and the longer leg. In this design when the arms are removed the gadget straightens so that the ladder and the hammock can be made. The wheels are attached to the longer leg. The handle is riveted to the back rest pad. In this gadget a cradle could not be made hence we made a stool attached to the support of the foot rest pad which can be brought out when a table is made.

We conducted a load bearing test on our gadget and found that this could bear weight of about 100 Kilograms. Our versatile design serves as multipurpose utility device that is portable & can be used as a camping companion & beyond.

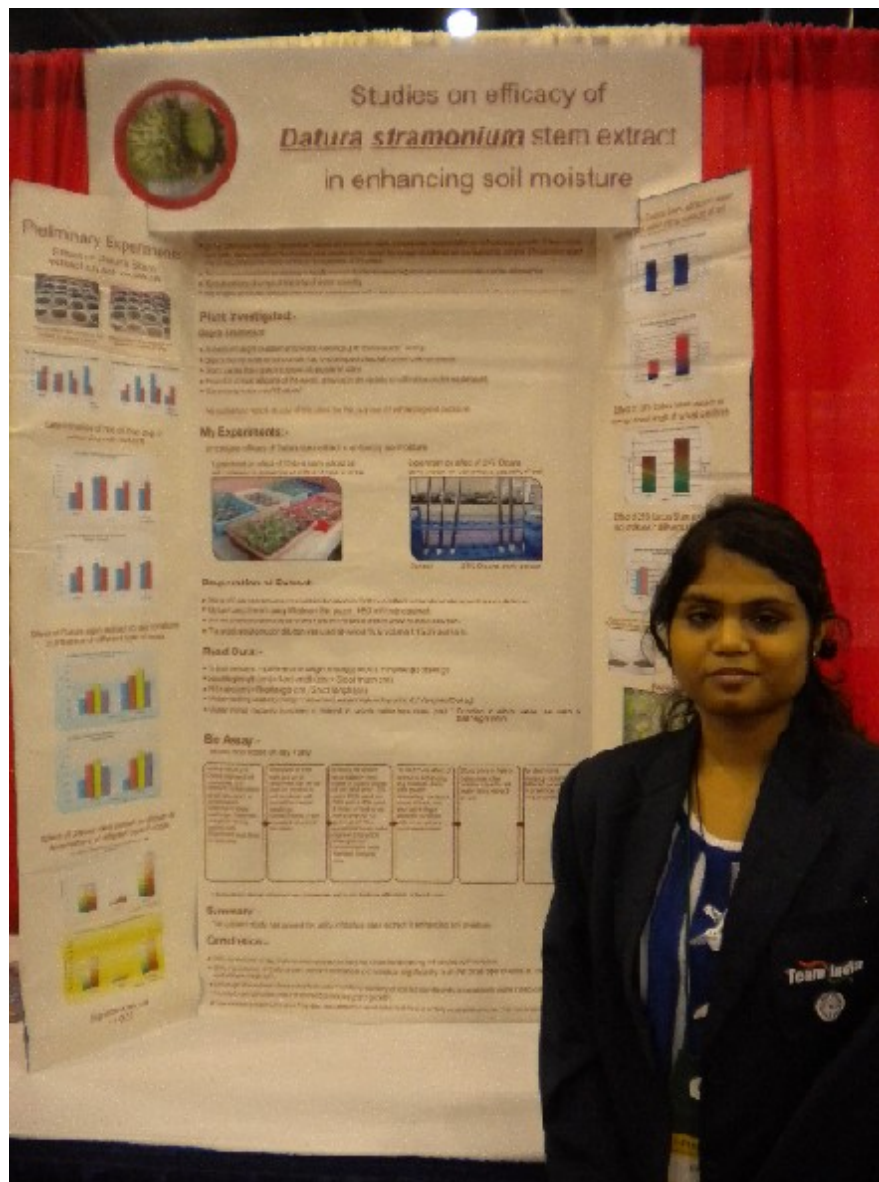
Effect of *Datura stramonium* stem extract in enhancing the soil moisture

By: Shireen Jaiswal

School : Centre Point School, Nagpur,
Maharashtra

Category: Environment

Award Won: Bronze medal



Shireen Jaiswal at I-SWEEP 2011

Title: Effect of Datura stramonium stem extract in enhancing the soil moisture
Shireen Jaiswal, Centre Point School, NAGPUR, MAHARASHTRA

Abstract:

Water is an important factor that determines yield of crop. It is a common observation that most of the crops suffer heavy loss due to inadequate soil moisture. Under such circumstances, efforts are needed to increase soil moisture. One of the ways to achieve this is by increasing the water holding capacity of the soil. Hence in present investigation, attempts were made to study the effect of stem extract of Datura stramonium (Datura) in enhancing soil moisture. During my earlier studies, I had observed that soil treated with plant extracts remained moist for longer duration. In the preliminary study, different combinations of sand and soil were prepared and irrigated with Datura stem extract at different concentrations in presence or absence of wheat seedlings. After 8 days it was found that treatment with Datura stem extract has increased the moisture appreciably in the soil where plant was growing. Thus, it was concluded that plant plays an important role in increasing soil moisture. Therefore a comparative study was carried out using different types of plants.

In next phase of experiment wheat, rice, groundnut and mustard were selected for study. The experiments were carried out in 25%soil+75%sand and 75%soil+25%sand. The results led to conclusion that soil moisture is considerably enhanced in case of cereals after treatment, whereas it is nearly unaffected oilseeds. Results for next phase are awaited.

Also future experiments will be done- to test water holding capacity in different types of soils along with finally a field trial.

2010



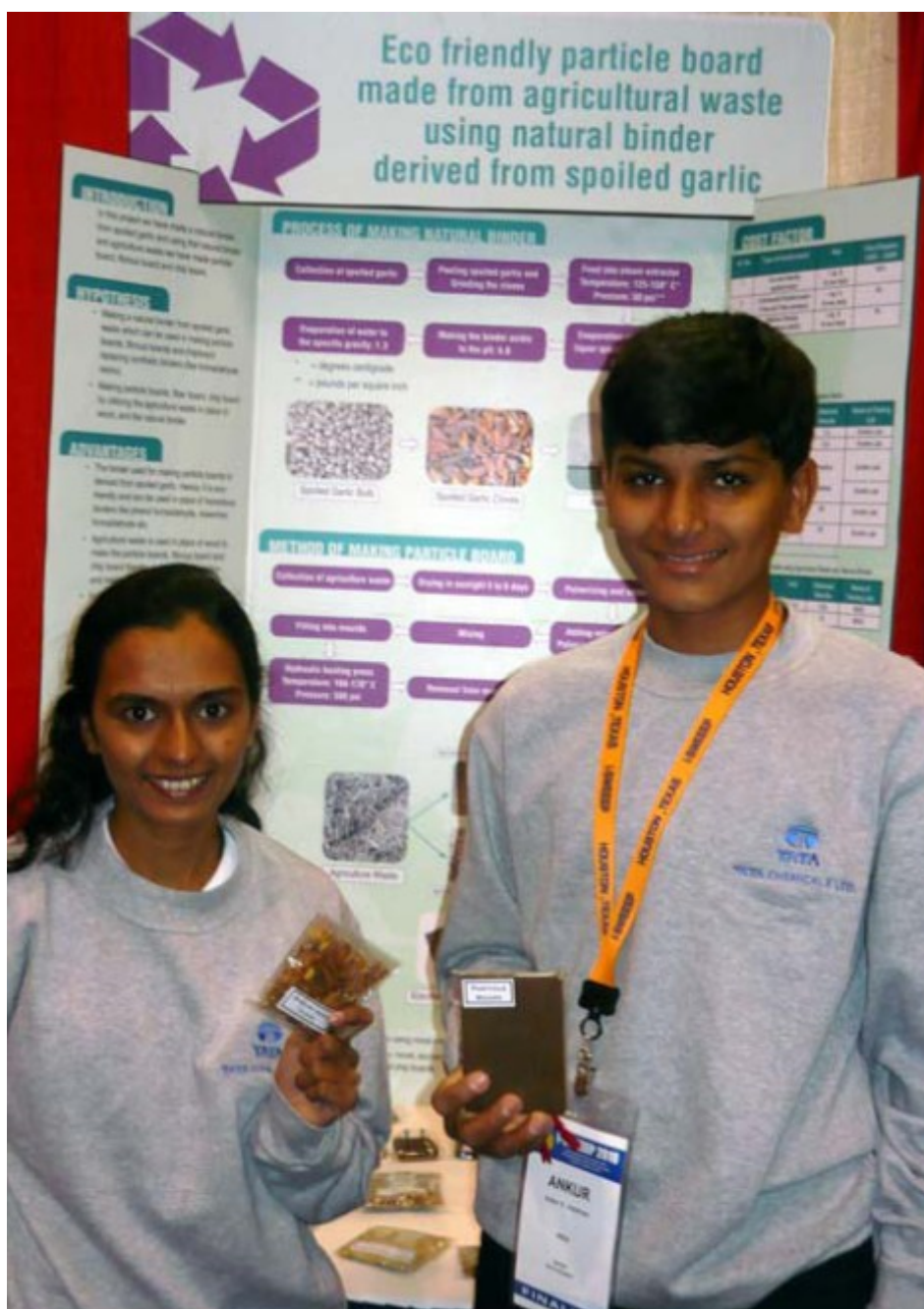
From Left: Shireen Jaiswa, Hetal Vaishnav, Ankur Vaishnav & Vishnu Jayaprakash at I-SWEEP 2010

Sent Three Projects

**Awards Won: 1 Silver medal,
1 Bronze medal &
1 Hon. Mention**

By: Ankur Vaishnav and Hetal Vaishnav
School: Late Shree S.G.Dholakiya High School,
Rajkot, Gujarat
Category: Environment

Award Won: Hon. Mention

**Hetal Vaishnav & Ankur Vaishnav at I-SWEEP 2010**

Title: Eco-friendly particleboard made from agricultural waste using natural binder derived from spoiled garlic

Ankur Vaishnav and Hetal Vaishnav, Late Shree S.G.Dholakiya High School, Rajkot, India

Abstract:

In our project we have prepared a natural binder from spoiled garlic and used that binder to make particle boards from agricultural waste, hence making a completely natural recycled product free from synthetic binding agents.

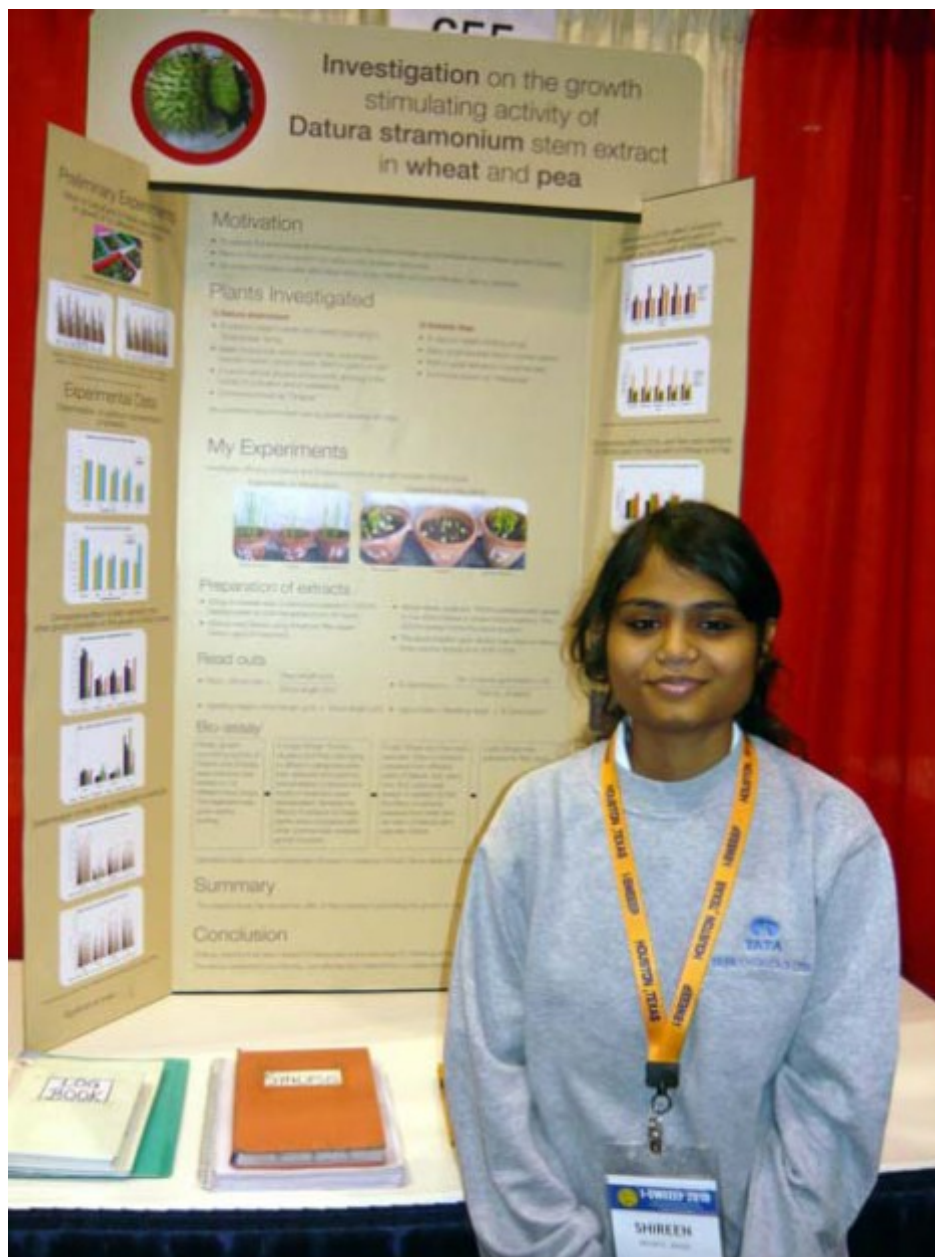
First a natural binder was made from spoiled garlic, an otherwise waste product, via a simple process of steam extraction. Spoiled garlic was collected, the cloves peeled, ground and fed to a steam extractor. The extracted liquor was treated with acetic acid to adjust the pH to 4 and preheated to thicken it (specific gravity ~1.3). Next agricultural waste (cotton/castor straws, wheat/groundnut husk) was collected and sun dried, crushed and pulverized to a powder. 100g powder and 35ml natural binder were mixed properly, filled into a mould and kept in a hydraulic press at an appropriate pressure and temperature to convert it into a composite product. After cooling, the mould was opened to remove the sheet.

Physical properties (flexural/tensile strength*, nail/screw holding*, breaking load, termite* & fire resistance) of our particle boards were compared with commercially available particle board/medium density fibreboard. Chemical analysis* of the binder was also carried out to determine its adhesive properties. (* indicates measurements by external labs). The physical properties of our recycled board compare well with those of commercial particle board but with our cost being 25% cheaper. Adding different ingredients allows us to obtain different properties (surface finish, increased strength, improved water resistance). Instead of using agriculture waste in powder form, using fiber form gave 91% higher strength. The main advantage of our process is that it uses a natural binder derived from spoiled garlic instead of synthetic phenol- or urea-formaldehyde binders. Further we use agricultural waste instead of wood. The binder itself and process are novel and result in economical, ecofriendly particle boards suitable for various applications.

Growth stimulating activity of Datura stramonium Stem extract in Wheat and Pea

By: Shireen Jaiswal
School: Centre Point School, Nagpur, Maharashtra
Category: Environment

Award Won: Silver medal



Shireen Jaiswal at I-SWEEP 2010

Title: Growth stimulating activity of Datura stramonium Stem extract in Wheat and Pea
Shireen Jaiswal, Centre Point School, Nagpur, India

Abstract:

Indiscriminate use of synthetic fertilizers harms the environment. In a search for safe, ecofriendly sustainable agricultural alternatives my project focuses on natural growth boosters from locally available plants. I performed a detailed study of the influence of stem extracts of Datura stramonium on the growth of wheat and pea plants.

Before narrowing down on this work I examined the effects of extracts of Datura stramonium (“Dhatura”, a weed) and Embelia ribes (“Wawdinga” a local medicinal plant) on 14 different food crops in a preliminary study. In all cases extracts were prepared by crushing and soaking the plant part in 10 volumes of water at room temperature for 48 hrs, to prepare a stock solution, and diluted as required. The effects of extracts on the length of seedling, rate of seed germination and vigour index were evaluated in experiments conducted in propagators. Based on this wheat, pea, mustard & tomato were selected for further studies on fixing an optimum dose, determining the mode of treatment of extract, and comparison with other growth boosters. Finally wheat and pea were shortlisted for detailed study. An experiment was designed to compare the effect of extracts made from different parts of Datura - leaf, stem, root, and fruit. Extracts were applied on 1st day after germination as per data obtained from the mode of treatment experiment. Since stem extract gave best results, an experiment to compare the effect of dry and fresh stem extract was carried out in the concentration range 0-30%. Effect of extracts was tested on growth and germination of seeds. Further, field trials in 8x8ft size plots were carried out. In all cases significantly improved growth (over control) was observed on treatment with Datura, with 25% dry stem extract giving the best results. Laboratory tests conducted elsewhere showed no presence of toxic Datura alkaloids in the food crops. My work thus shows Datura stem extract to be a novel growth stimulant for wheat and pea.

A Novel Cowdung Based Fuel Cell (CDFC) using Inexpensive Proton Exchange Membrane and Graphite Sheet Electrodes

By: Jayaprakash Vishnu
School: Chettinad Vidyashram, Chennai,
Tamilnadu
Category: Environment

Award Won: Bronze medal



Vishnu Jayaprakash at I-SWEEP 2010

A Novel Cowdung Based Fuel Cell (CDFC) using Inexpensive Proton Exchange Membrane and Graphite Sheet Electrodes

Jayaprakash Vishnu, School: Chettinad Vidyashram, Chennai, India

Abstract:

For practical application of renewable energy sources in rural areas, an inexpensive design based on locally-available raw materials is essential. I have designed a Microbial Fuel Cell (MFC) that uses cow dung as a substrate. In an MFC bacteria catalytically convert chemical energy in a bio-convertible substrate directly into electricity, without releasing substantial amounts of greenhouse gases.

The cow dung based fuel cell (CDFC) was fabricated using acrylic chambers. The anode contains cow dung and the cathode has potassium ferricyanide which acts as the terminal electron acceptor. The chambers are separated by a proton exchange membrane (PEM). My critical contribution in the design is in using inexpensive graphite electrodes and identifying low cost substitutes for Nafion®, a widely used but expensive PEM.

The use of cow dung and graphite sheet electrodes itself reduces the cost of my CDFC by 90% compared to average MFCs. However half the CDFC's \$5 cost is the Nafion® PEM! To replace this expensive, imported component, I tried out several cheaper membranes such as CMI-7000, AMI-7001 (Membranes International Inc.) and those made locally from Poly Vinyl Alcohol Sulfo Succinic Acid (PVASSA), Sulphonated-Poly-Ether-Ether-Ketone (sPEEK).

In my project I have compared the efficiencies and costs of my CDFC when using different membranes. CDFCs using CMI-7000 & AMI-7001 gave 13% more voltage compared to Nafion®. Their power densities are $\sim 2\text{W/m}^2$ and 1.6W/m^2 while their current densities are $\sim 2.5\text{A/m}^2$ and $\sim 2.1\text{A/m}^2$ respectively (for Nafion® CDFCs, the corresponding values are 0.76W/m^2 and 1.24A/m^2). Using these membranes increases efficiency & reduces the overall cost by a further 40%. These CDFCs can power an LED continuously for 4 days (longevity). PVASSA membranes provided highest power density but with decreased longevity, I am still working to improve this. These changes should result in very economical, efficient CDFCs for rural LED lighting.