NEWSLETTER

EMCB-ENVIS NODE
ON
ENVIRONMENTAL BIOTECHNOLOGY
Department of Environmental Science
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EDITORIAL

Increasing industrialisation, agricultural and commercial activities have brought about many untoward changes in the environment. Many such problem needs to be handled with biotechnological approches in 21st Century. This EMCB-ENVIS node on Environmental Biotechnology thus collect information and collate them in compiled form for various user interface.

I am sure our endeavour will help both accademics and enterpreuners in the longrun.

Prof. S. C. Santra
Editor

The EMCB-ENVIS Node at Kalyani

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ECOFRIENDLY SOLID WASTE MANAGEMENT IN LEATHER INDUSTRY

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Indian Leather Industry occupies an important position in foreign exchange earning. This phenomenal growth obviously calls for the processing of enormous amount of hides and skins. So environmental pollution control in leather industry has become a matter of increasing concern in India. The tanning process involves pretanning, tanning and post tanning operations. During the process of manufacturing, substantial amount of solid and liquid wastes are generated. It is already estimate that 1 ton of wet salted hide yields only 200kg leather while 600kg comes out as solid wastes which includes raw trimmings and fleshing, blue shaving, trimmings and buffing dusts etc (Fig -1).

Rawhide (1 ton) → 200 kg leather

50 m3 liquid effluent containing-	
COD	235-250 kg
BOD5	100 kg
Suspended solids	150 kg
Chromium	5-6 kg
Sulfide	10 kg

Solid waste and by-products -	
Untanned	
Raw trimming	120 kg
Fleshings	70-230 kg
Tanned	
Blue sheetings	115 kg
Trimming + Shavings	100 kg
Dyed/finished waste	2 kg
Buffing dust	32 kg
Trimming	

Fig.-1 : Environmental input of leather processing.

These are all considered as solid by-products for which no proper environment friendly methods have been adopted to handle, minise or utilize. Historically, shavings, trimmings and splits from the chrome tanning of hides and skins have been disposed off in landfills. Increased local restrictions or land disposal have encouraged the tanning industry to explore more innovative methods to treat these waste products. Partly it is being used for glue and gelatin preparation, leather board and fertilizer preparation, for which chemical methods are followed. Basic hydrolysis steps are also used to make some other products. Chromium and a protein fraction could isolated using Ca(OH)2 with steam or NaOH. Use of Na_2CO_3 and NaOH in combination could produce coagulants for natural rubber and leveling agents for leather dying. Acid hydrolysis has produce a chromium containing hydrolysate useful as a retanning agent.

Apart from these chemical treatments of leather waste, it has been demonstrated in the literature that waste products from fleshings and beam house operations can be treated with enzymes at low temperature for short period of time to give products with commercial values. Enzymatic treatment of solid tannery waste gained importance in recent past due to environmental restriction imposed on disposal of wastes. It is ecofriendly, energy shaving and a mild process which results in isolation of many value-added products of commercial importance. Chrome shaving, treated with proteolytic enzyme at moderate temperature gives rise to two valuable products i.e. the chrome cake and the collagen hydrolysate. This process is unique in that chromium is insoluble under the reaction condition (pH 8.3 to 10.5). Thus both the possible conversion of Cr(III) to Cr(VI) and the poisoining of the enzyme by chromium are averted. Chromium isolated from these treatment is mainly in the form of $Cr(OH)_3$. Some portion of this chromium could be combined with the fresh chrome in a variety of tannery process. The chrome cake may be treated chemically to give a recyclable chrome product. Other uses include addition of recovered chrome to cement and morters.

The collagen hydrolysates recovered from enzymatic treatment of chrome shavings finds use as ingredients to produce fat liquors, surfactants and fillers for leather manufacture. The surface action properties of this hydrolysates contribute to their utility in adhesive formulations. The gelable protein fraction has potential for use in a variety industries like cosmetics, printing or photography and those manufacturing gross polymerised products. The collagen hydrolysate obtained from chrome shaving and vegetable tanned shavings find uses as ingredients in fertiliser. Land application has shown to have a beneficial effect on soil fertility and plant growth. Another important site of application of collegens hydrolysate is animal feed preparation. This protein concentrate contains about 80% protein and 25% essential aminoacid. Chicken feeding results have shown that the nutritional value of hydrolysed leather meal is nearly one half of the nutritional value of protein-soyabean meal. Limed fleshings are important byproducts of tanning industry having a good source of protein. It is one of the waste available in the wet condition. So by enzymatic treatment, good amount of protein hydrolysate and fats are obtained. By virtue of its ready solubility as well as its ability to form clear, colorless, odourless solution, this hydrolysate has been widely used in hair care products, cosmetics, gelatin and other protein based industries.

Another biotechnological approach of utilization of tannery solid wastes "anaerobic treatment". Untanned and tanned waste which have high organic content and humidity level are readily degraded by methogenic fermentation. In anaerobic fermentation, solid waste undergo enzymatic hydrolysis while organic matter is attacked by complex combination of bacteria in a state of symbiosis and in successive stage to produce NH_3, short chain fatty acids, acetic acid, carbondioxide and hydrogen. This is termed a "Acidogenesis" and is achived in a matter of hours by acidifying bacteria. Simultaneously, the other low growth rate bacteria, known as "Methanogenic", can produce methane by two quite distinct routes either from hydrogen and carbondioxides as

$CO_2 + 4H_2\ 2\ CH_4 + 2H_2O$

or by degrading acetic acid as

$CH_3COOH\ 2\ CH_4 + CO_2$

The chromium (III), present in tannery sludges, practically does not decrease gas production, upto concentrations over 1000 mg/l. The biomass generates after methenogenesis can be used for land filling.

Leather industry in India enjoys the potential needed to gain global leadership. It may have suffered a negative public image in the past due to neglect of its environmental responsibility and for want of adequate technological support. There is now a new sense of environmental comitment on the part of the tanners in many part of our country. It is appropriate that the leather sector in the country consolidates the strength gained through appropriate environmental actions and strives to overcome the negative image created in the past. Best practices is the need of the loan which is to be propagated and readily absorbed to erage this image. In this context, biotechnology is the only option to be practical to bring the Indian leather sector globally sustainable through the adoption of eco-friendly technologies in processing water, cost, energy saving and in waste management.

SLAUGHTER HOUSE WASTE UTILIZATION

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Animal is slaughtered for meat which is the 'main product'. All other parts including the hides and skins are termed as the 'by-product'. The animal by-product can be categorized into edible and inedible by-products. Edible by-products are liver, heart, torgne, ox-tail, brain, kidney, trip, intestines and testicles. The inedible by-products are ruminal contents, horns and hooves and some organs and glands.

Edibility of course is determined by customs, religion, consumer acceptance, availability of the product, economics, hygiene and purchasing power of the consumer. In most of the developing countries the purchasing power is poor and hence most of the soft tissues are used for edible purposes.

There are about 3600 authorized slaughter house in India. Besides this there are many illegal slaughter house which account for nearly 25% of the total slaughter. In most of the slaughter houses the animal by-products are not utilized optimally. The annual loss to the country by under utilization or non-utilization of these slaughter house by-products is estimated to be around Rs. 1000 crores.

The classification of animal by-products is shown in Fig.-1.

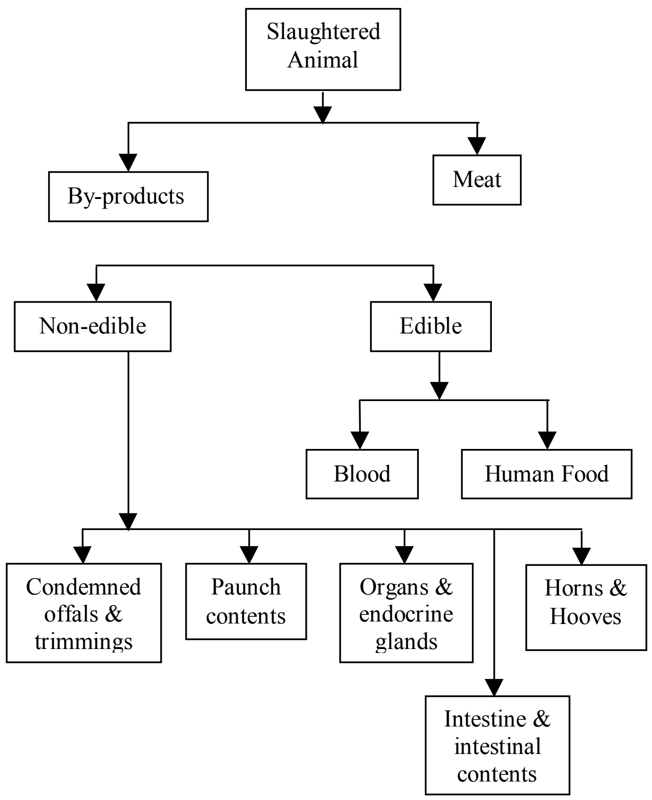

Fig.-1 : By products of a typical slaughter home.

Hides and skins are utilized for making leather goods, footwear etc. Green bones used for edible purpose from slaughter houses are available in very negligible-quantity in India and other developing countries. However around 500 thousand MT of bones are available from fallen animals and meat processing plants but only about half of estimated amount is collected and processed. Some of the product manufactured by the bone based industries are glue, gelatine, dicalcium phosphate., bone meal, bone chart and ossein.

The various product of bone are shown in Fig.-2.

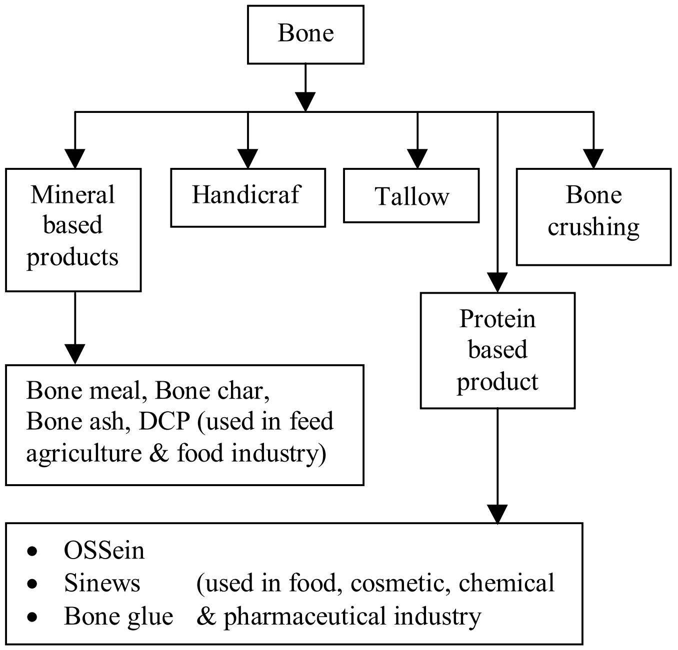

Fig.-2 : Various bony by-products of slaughter house.

Cattle blood is collected in certain metropolitan cities by pharmaceutical firms for use in some haematonic preparations. However in most of the abbatoirs the blood is wasted as the abbatoirs are not equipped for proper collection. Therefore blood from abbatoirs can only be utilized in livestock/ poultry feeds in the form of blood meal. Blood contains about 18-20% dry matter of which 85-90 % crude protein. Expect for methionine, blood is rich in other essential amino acids. Blood can also be processed into a dry product by bleading it with sufficient quantity of organic carrier like rice bran or dry ruminal contents. This mixture often suitably processing can be used as a feed supplement for poultry. Plasma protein obtained from blood can also be used in preparing animal feeds and certain biochemicals.

Traditionally horns and hoofs, particularly from buffalo are used for the manufacture of handicarfts like buttons, cutlery handles, combs or other fancy article. Horn and hoof meal contains about 15% nitrogen and it is a desirable nitrogen fertilizer particularly in horticulture. Horn and hoof meal hydrolysate finds use in livestock feeds, cosmetics and in the manufacture of fire foam extinguishers. An acid hydrolysate of this keratinous protein has its use as a flavouring agent in soup concentrates.

Small intestines of animals are processed into sausage casings. These are prepared from the sub mucosa coat of intestine of cattle, sheep and goat. Reconstituted casings, however are manufactured from hide trimmings. Surgical catgut is another product that has been developed from intestines. Condemned offals and condemned cancasses can be converted into meat and bone meal either by dry or wet rendering techniques. This meat and bone meal has a high nutritive source for livestock, poultry and aqua culture.

The animal by-products industry faces many problem and due to this the growth of the industry is hindered. Firstly there is lack of modern facilities at the abbatoirs and hence it is not possible to collect the by-products in a hygienic manners. Also since the slaughter is not carried out in a organized manner, the amount of material obtained at any given slaughter house is not in sufficient quantity. There is a lack of technically trained people who could process the slaughter house waste products for converting them into valuable end products.

Recently many biotechnological methods are being adopted to process the slaughter house wastes. The process are economically viable and environmental friendly when compared to the conventional method of processing. Some of the biotechnological methods are mentioned below:

Recently ensiling technique has been used to process ruminal contents into a product mixture having a good texture, aroma and palatability. The ensiled mixture is kept under anerobic condition for a period of 4-6 weeks to stimulate the growth of Lactobacillus species to produce lactic acid by fermenting carbohydrates. Another way of utilizing the ruminal contents is vermicomposting. Vermicomposting is an effective process of recycling organic waste and farm residues to increase humus and nutrient content of the soil. This a simple technology which can upgrade the value of animal wastes. It is done by using earthworm, cowdung, partially digested leaves and dried ruminal contents. One kg of adult earthworm can convert about 5 kg of wastes per day. The vermicompost produced not only contains nitrogen, phosphorus and potash but is also rich in vitamin and growth hormones which can be readily taken up by plants.

Bioconversion of keratin products have been successfully carried out to hydrolyse raw poultry feathers using two isolated strains of bacteria. Solid state fermentation technique with these bacteria have given encouraging results.

A lot of research still need to be carried out especially for processing certain organs and glands for producing pharmaceutical and cosmetic products. A number of hormones and biochemicals of high value can be prepared from certain glands and organs of slaughtered animals. For this however the abbatoirs should have facility for freezing or chilling the glands. Also special methods of collection are to be adopted to preserve the active ingredients in the glands.

The slaughter house wastes can therefore be utilized to develop a variety of products for various industries, like the food industry, feed industry, fertilizer, chemical, pharmaceutical and cosmetic industry. Moreover the utilizing the waste products, the disposal problem can be tackled easily and the environmental pollution caused by its disposal can be avoided to a larger extent.

MICROBIAL POPULATION AND NITROGEN FIXING POWER OF LANDFILL SOILS CONTAMINATED WITH HEAVY METALS

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Heavy metals entering into soil pose a severe environmental problem and remain several thousands of years. In soil, microorganisms enjoy a special significance. Heavy metals are known to severely affect microbial proliferation, survival and activity (Babich and Stotzky, 1985; Bååth, 1989).

Sewage sludge may improve soil fertility but there is concern about effect of sludge metals on soil microorganisms, and microbial processes including nitrogen fixation (Brookes, 2000; Moreno et al., 2002). In contrast to sewage sludge, municipal solid waste refuse, although contains heavy metals (Shiralipur et al. ,1992), improved microbial parameters in short term studies (Perucci, 1992; Pascual et al., 1999). Long term effect of municipal solid waste refuse on microorganisms is practically unknown.

Recently, Kolkata Municipal authorities have ventured to convert the solid wastes, dumped in the century old landfill site at the eastern fringes, into compost. This is being done for environmental concerns and to use the wastes for resource recovery while effectively disposing the nuisance. Olaniya et al.(1998) reported that the soils of Kolkata Dhapa landfill site are heavily contaminated with heavy metals. This study was conducted to get a projection of the long term ecological impact on the soils following use of these composts by way of quantifying the organism population level in terms of numbers of total bacteria, fungi, nitrogen fixers and nitrogen fixing power in relation to the heavy metals present in the soils.

The landfill soils contained much higher sand (45 -84%) and less silt (2-14 %) than the normal agricultural soil ALV (sand 2%, silt 63 %). Except LFS (41 %), generally the landfill soils had lower clay than ALV (34 %). The source of higher accumulation of day in LFS was possibly through sewage water irrigation. The pH of the landfill soils was in the range of 6.9 to 7.45, which indicated stabilization and methanogenic state of the wastes (Forstner et al., 1991). The higher EC values of the landfill soils than the ALV soil was due to the presence of dissolved salts inherent to MSW. The ALV, LFG and LFC soils had higher and statistically significant ($P<0.05$) CEC values than LFS and LFP soils. The organic-C contents of the landfill soils were 3-6 times more than the ALV soil due to the presence of higher amount of organic materials in MSW. The organic -C status among the landfill soils were in the order of LFC>LFG>LFP>LFS which seemed to be related to the history of land filling with different types of solid wastes and cultivation systems followed. The LFC soil registered the highest values of total N, available P and carbonate while ALV soil recorded the lowest. Results of these studies corroborated with the findings of Olaniya et al. (1998) at the Calcutta landfill site.

The maximum and minimum concentrations of total heavy metals were detected in LFP and ALV soils respectively (Table 1). (Comparing LFC and LFS soils, the total Zn content was higher in the former and Cu, Pb and Cd in the latter. The variation in the total heavy metals in the landfill soils was due to the heterogeneity in the waste materials dumps at the respective sites over the years. Among the heavy metals studied, total Zn content was highest and Cd the lowest in the soils. The Zn and Pb contents in the landfill soils were higher than the proposed maximum concentration of heavy metals allowed in agricultural soils treated with sewage and sludge by the European community but within acceptable limits proposed by USA (Brookes, 2000). Analyses of total heavy metals reveal the metal load and likely extent of pollution that may arise from composted-MSW application to soil. The landfill soils differed in respect of the contents of bioavailable (DTPA and water soluble) forms of heavy metals (Table 1). Water soluble Cd was beyond detection limit in the soils studied. Among the bioavailable forms, DTPA extractable Zn and water soluble Pb were predominant. Results indicated that compost derived from such MSW might increase the labile metals load in soil on application to land.

Statistically significant variation in bacterial, fungal and aerobic, heterotrophic, diazotroph counts as well as N fixing power of soil was evident (Table 2). The ALV soil recorded the lowest microbial population and N-fixing power compared to the landfill soils. There were however, variations in microbial populations and nitrogen fixing power among the landfill soils.

Highest population of fungus, diazotrophs and N-fixing power were observed in LFG soil. Although LFC soil recorded higher bacterial count, it was statistically similar to LFG soil.

Nitrogen fixing power of the soils corresponded to the heterotrophic nitrogen fixing population. There are some data to suggest that both heterotrophic and non-symbiotic nitrogen fixation would be suitable tests for soil pollution by heavy metals. Brookes et al. (1984) and Lorenz et al. (1992) found that heavy metals close to or less than current permitted European Community limits, decreased heterotrophic nitrogen fixation up to 90% in sewage amended soil. On the other hand, Rother et al.(1982) found no consistent effect of heavy metals on nitrogen fixation. They opined that the most important factor determining nitrogen fixation activity was instead soil moisture content. In spite of the higher heavy metals content, the higher nitrogen fixing population and nitrogen fixing power of the landfill soils compared to ALV soil could be explained by the fact that the bacteria in the landfill soils were adapted to potentially toxic concentrations of the heavy metals or that the metals were present in non toxic forms (Rother et al., 1982). Tolerance and adaptation of the microorganisms to heavy metals are common phenomena and the presence of tolerant fungi and bacteria in polluted environments has frequently been observed (Bååth 1989).

Table-1 : Metal concentrations of soils (average of two years data)

Soil	Total				DTPA extractable				Water soluble			
	Zinc	Copper	Lead	Cadmium	Zinc	Copper	Lead	Cadmium	Zinc	Copper	Lead	Cadmium
ALV[a]	46	36	24	0.23	2	5	2	0.006	0.009	0.09	0.2	BDlg
LFS[b]	436	347	321	10.3	92	81	65	0.71	0.29	2.5	1.49	BDL
LFP[c]	609	377	374	17.95	96	86	76	3.09	0.31	2.56	1.59	BDL
LFG[d]	576	341	338	10.45	54	47	39	0.55	0.1	0.74	0.57	BDL
LFC[e]	555	300	269	9.7	58	48	41	0.68	0.15	1.15	0.78	BDL
LSD1 (P<0.05)	11.35	16.97	7.44	1.25	4.01	4.7	3.68	0.04	0.008	0.033	0.024	BDL

a Normal agricultural alluvial soil.
b Landfill soil irrigated with sewage water.
c Landfill soil irrigated with pond water.
d Landfill soil growing grass.
e Landfill soil with orchard intercropped with maize.
1 Least significant difference.
g Below detection limit.

Table-2 : Microbial population and nitrogen fixing power of soils (average of two years data)

Soil	Total bacterial count (g-1 soil x 106)	Fungal count g-1 soil x 104)	N-fixers count g-1 soil x 105)	N-fixing power (mg N g-1 soil)
ALV[a]	31	43	81	4.44
LFS[b]	42	84	118	5.74
LFP[c]	44	80	92	5.23
LFG[d]	64	113	158	7.04
LFC[e]	65	87	145	6.6
LSD1 (P<0.05)	2.38	2.09	10.52	0.41

a Normal agricultural alluvial soil.
b Landfill soil irrigated with sewage water.
c Landfill soil irrigated with pond water.
d Landfill soil growing grass.
e Landfill soil with orchard intercropped with maize.
1 Least significant difference.
g Below detection limit.

Correlation

Total bacterial, fungal, nitrogen fixing populations and nitrogen fixing power of the landfill soils were in most cases negatively correlated with the heavy metal species (Table 3). The negative correlation co-efficients (r) of the bioavailable (DTPA and water soluble) heavy metals were greater and statistically significant than the total heavy metals in most cases, particularly with total bacterial count, nitrogen fixing population and nitrogen fixing power. In case of fungal count, however, no statistically significant association was observed with the heavy metal species. Hiroki (1992) observed that among the microbial populations, the degree of tolerance to heavy metals appears to be higher in fungi than bacteria. The negative correlation co-efficients of water soluble metals were generally greater than DTPA extractable form in their association with the microbial counts and nitrogen fixing power. This signified that with the increase in bioavailability, the heavy metals exerted more inhibitory effect on these parameters. The results suggested that long term application of compost derived out of Kolkata municipal solid waste should be carefully monitored with periodic ecological assessment.

Table-3 : Correlation matrix (r) between microbial parameters and heavy metals species in landfill soils.

Parameter	Total bacterial count (g-1 soil x 106)	Fungal count g-1 soil x 104)	N-Fixers count g-1 soil x 105)	N-fixing power of soil (mg N g-1 oven dry soil)
Total Zn	0.401 NS[a]	0.220 NS	- 0.001 NS	0.113 NS
DTPA Zn	-0.983*	- 0.728 NS	- 0.953*	- 0.971*
Total Cu	- 0.742 NS	- 0.185 NS	- 0.730 NS	- 0.689 NS
DTPA Cu	- 0.981*	- 0.720 NS	- 0.958*	- 0.971
Water soluble Cu	- 0.973*	- 0.813 NS	- 0.943 NS	- 0.973*
Total Pb	- 0.570 NS	0.063 NS	- 0.542 NS	- 0.488 NS
DTPA Pb	- 0.942 NS	- 0.715 NS	- 0.982*	- 0.980*
Water soluble Pb	- 0.969*	- 0.812 NS	- 0.958*	- 0.983*
Total Cd	- 0.544 NS	- 0.441 NS	- 0.818 NS	- 0.745 NS
DTPA Cd	- 0.542 NS	- 0.529 NS	- 0.843 NS	- 0.774 NS

a Not significant.

* Significant at 0.05P

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INSTITUTION NEWS

Vivekananada Institute of Biotechnology and its activities

Vivekananda Institute of Biotechnology was established in the year 1990 with a project Technology Development and Demonstration Project on Biofertilizers-BGA & *Azolla* funded by D.B.T, Government of India and the objectives were -

(i) Collection, isolation, purification, and selection of region specific BGA strains

(ii) To produce starter culture and provide materials particularly to farmers of West Bengal

(iii) To serve as quality assurance centre for the material produced by the farmers.

(iv) Demonstration, training and awareness building on BGA technology

The achievement of the project led to further programme on MMP & INM and result of the projects are quite encouraging.

Following programmes are now being persued.

(a) Programme on Biofertilizer Technology

A regular collection and selection of different biofertilizers are a continuous programme apart from maintenance of total 449 strains of different biofertilizers (6 spp. of *Azolla*, 384 of BGA, 10 of *Rhizobium*, 14 of *Azotobacter*, 35 of PSB, PSM). The significant addition to this work is VAM (Vesicular Arbuscular Mycorrhiza). VAM strains are included in our collection recently and efforts are being made to produce in mass this important organism. This year 4,265 packets of biofertilizers (*Azotobacter* and *Rhizobium*) were distributed amongst the farmers. It is of immence satisfaction to state that the *Azolla* technology has become an integrated part of the paddy cultivation practices amongst a good number of farmers of south 24 Pgs and to some extent amongst the farmers of Burdwan,Nadia,Midnapure, North-24 Pgs, Howrah, Hoogly, Purulia and Bankura. The project work on "Development of a Model for *Azolla* Utilization Technology in Deep Water Rice System of Sundarban Area, West Bengal" has been completed successfully and *Azolla* production units have been initiated in several gram panchayats in South 24 Parganas. Total 308 farmers were involved in this programme and 630 bighas of land came under the cover of *Azolla*.

The work on soil testing, fertilizer recommendation, delivering the recommendation to the farmers and employment generation through this programme is one of the most important aspect of this programme.

Recently, we have initiated programmes on vermiculture, the aim of which is to help farmers to produce earthworms and vermicompost.

(b) Programme on Biopesticide Technology

Last year, the programme on neem supported by UNDP and Ministry of Chemicals and Petrochemicals, Govt. of India, was initiated, and about forty tons of neem seeds were collected. Through this programme about 5000 man days employment were generated (worth of Rs. 2.4 lakhs) out of which 774 are for women. The aim of the programme is to promote the use of environment friendly biopesticide available from nature.

(c) Programme on Plant Tissue Culture

Thirteen cultivers of banana are being maintained under culture condition as well as in trial plots.The varieties are Baischada Kachakel", "Martaman", "Champa", "Giant Governer", "Robusta", "Red Banana", "Pachanandan", "Rasthali", "Monthan", "Nendran" In this year, 10,000 plantlets were produced and supplied to the farmers. The concept that hardening can be a source of income for the village level women is now established through this programme. On campus training on primary hardening of the bottled plantlets is oganised from time to time. Total 8500 plantlets have been supplied to Tripura Govt. (Through the W.B.Govt.) A new project sanctioned by DST entitled "Establishment of papaya tissue in culture and standardization of its micro-propagation method for Sundarban area,W.B." is being taken up for implementation. The aim of the programme is to make it a techno-economically viable option.

(d) Programme on Mushroom Technology

Our effort is to promote mushroom cultivation as a viable source of income through out the year. The work is being carried out on Oyster (*Pleurotus spp*), paddy straw (*Volvariella spp.*) and milky white (*Calocybe spp.*). At present 22 strains of 12 spp. are being maintained in the laboratory. In this year total 1.0 MT of fresh mushroom was produced in our Department and 17,260 packets of spawn were supplied to the growers. The Sundarban Development Board is a close collaborator of the programme. The project entitled "Demonstration of Oyster Mushroom Cultivation Technology as a source of income amongst the SC/ST population of Kultali Block of Sundarban area, West Bengal" supported by DBT is successfully completed. Through this programme 222 people were trained and supported for the production of Oyster mushroom throughout the year in Kultali block. In this block 389 demonstrations were organised for the awareness building programme. The project entitled "Field level optimization of cultivation technology of the mushroom *Calocybe indica* as a stable source of income for the people of Sundarban area" funded by DST is presently being continued. The aim of the programme is to optimise the field level cultivation technique of this mushroom.

(e) Programme on Vocational Training

VIB is continuing its effort on conducting vocational trainings in the field of biotechnology. The Training programme under UNDP-DST support is being continued and expected to be completed at the end of this year. Distinguished scientists from several institutions have extended their kind help to us for successful implementation of the programme.

CONFERENCE NEWS ON ENVIRONMENTAL BIOTECHNOLOGY

Event Molecular Targets for Cancer Therapy: 3rd Biennial Meeting

Begins October 1,2004

Ends October 5,2005

Papers : Ab. MT2004

Country USA

State FL

City St. Petersburg Beach

Email gordonac@moffitt.usf.edu

Category Health: Medicine

Category 2 Science: Biology

Category 3 Science: Biotechnology

Exhibits

Organization

Contact 12902 Magnolia Drive Tampa, FL 33612

URL http://www.moffittcancercenter.com

Description The purpose of this meeting is to foster exchange of the most recent findings and ideas in molecular targets for cancer therapy. Special emphasis will be placed on bridging basic science and clinical research to create new collaborations between disciplines. Conference will include keynote speaker, reception and banquet dinner, session lectures, short talks, call for abstract and poster session, exhibits and several meal fanctions. Free time has been set aside for networking with colleagues from around the world.

Additional Information

Exhibits Y

Organization

Contact Suite 1710, 10303 Jasper Avenue, Edmonton, AB

URL http://www.remtech2003.com

Description RemTech 2003 is the premier remediation technology transfer event for environmental professionals, encompassing the latest innovations in soil and groundwater remediation.

Over 250 delegates from across North America are expected to attend keynote speeches and 40 technical presentations. To be held in conjunction with the Symposium is an environmental industry trade exhibition RemTech 2003 is brought to you by the Environmental Services Association of Alberta (ESAA).

Additional Information Prices:

ESAA Member/Event Partner: $700 Canadian

Non-Member: $825 Canadian

SCIENCE NEWS UPDATE

VITAMIN C PREVENTS CIGARETTE SMOKE -INDUCED OXIDATIVE DAMAGE IN VIVO

Koustubh Panda, Ranajoy Chattopadhyay, Dhruba J. Chattopadhyay and Indu B. Chatterjee

Dr. B. C. Guha Centre for Genetic Engineering and Biotechnology and Department of Biochemistry, Calcutta University College of Science, Calcutta, India

Our recent in vitro results indicate that cigarette smoke induces oxidation of human plasma proteins and extensive oxidative degradation of the guinea pig lung, heart, and liver microsomal proteins, which is almost completely prevented by ascorbic acid. In this paper, we substantiate the in vitro results with in vivo observations. We demonstrate that exposure of subclinical or marginal vitamin C-deficient guinea pigs to cigarette smoke causes oxidation of plasma

proteins as well as extensive oxidative degradation of the lung microsomal proteins. Cigarette smoke exposure also results in some discernible damage of the heart microsomal proteins. The oxidative damage has been manifested by

SDS-PAGE, accumulation of carbonyl and bityrosine, as well as loss of tryptophan and protein thiols. Cigarette smoke exposure also induces peroxidation of microsomal lipids as evidenced by the formation of conjugated dienes,malondondialdehyde, and fluorescent pigment. Cigarette smoke-induced oxidative damage of proteins and peroxidation of lipids are accompanied by marked drop in the tissue ascorbate levels. Protein damage and lipid peroxidation are also served in cigarette smoke-exposed pair-fed guinea pigs receiving 5 mg vitamin C/animal/day. However, complete protection against protein damage and lipid peroxidation occurs when the guinea pigs are fed 15 mg vitaminC/animal/day. Also, the cigarette smoke-induced oxidative damage of proteins and lipid is reversed after discontinuation cigarette smoke exposure accompanied by ascorbate therapy. The results, if extrapolated to humans, indicate that comparatively large doses of vitamin C may protect the smokers from cigarette smoke-induced oxidative damage and associated degenerative diseases.

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