



# NEWS LETTER

OIL TECHNOLOGISTS' ASSOCIATION OF INDIA  
WESTERN ZONE

## Inside This Issue

- The Soap Opera
- Green Trend
- Be Natural
- Mushrooms cosmetic magic
- Biomass & Surfactants
- Ecofriendly Soaps
- Jatropha - alive and Kicking

A BILLION PEOPLE.

A TRILLION DREAMS.

A ZILLION OPPORTUNITIES.

WELCOME TO INDIA...THE EMERGING MARKET.

WELCOME TO ISDC 2011.

**INTERNATIONAL CONFERENCE ON SOAPS, DETERGENTS & COSMETICS**  
December 11-13, 2011 at Nehru Centre, Mumbai, India

Organised by

<b>IHPICIA</b> INDIAN HOME & PERSONAL CARE INDUSTRY ASSOCIATION 481, Dnyu, 5th floor, 375, S. V. Road, Goregaon (W), Mumbai-400104. Ph: +91 22 2878 2868 +91 22 2878 6298 Fax: +91 22 2873 3419 Email: info@isdcconference.com	<b>OIL TECHNOLOGISTS' ASSOCIATION OF INDIA</b> (West Zone) Department of Oils, Oleochemicals & Surfactants, Institute of Chemical Technology, Matunga, Mumbai-400079. Email: otai-wz@isdcconference.com
--	--

Visit us [www.isdcconference.com](http://www.isdcconference.com) for more information

**This news letter is for free circulation only to the members  
of OTAI-WZ**

C/o. Department of Oils, Oleochemicals & Surfactants  
Institute of Chemical Technology Tel.: 91-22-32972206/91-22-24146526  
(Formerly UDCT) Fax: +91-22-24124017  
Nathalal Parekh Marg Email: info@otai-westernzone.org  
Matunga (East), Mumbai-400 019 Website: www.otai-westernzone.org  
INDIA.



**OIL TECHNOLOGISTS'  
ASSOCIATION OF INDIA  
WESTERN ZONE**

**EDITORIAL ADVISORY BOARD**

A.K. GUPTA  
RAJEEV CHURI  
S.N. TRIVEDI  
B.R. GAIKWAD

**EDITOR**

V.V. RAO

**EDITORIAL BOARD**

AMIT PRATAP  
D.N. BHOWMICK  
B.V. MEHTA

## *From the Editors's Desk*

*New year and new adventures. **OTAI** and **IHPCIA** working in tandem will show new avenues in technology and economics. Exciting events will blister the new road maps. Come December - An International Conference on Soaps, Detergents and Cosmetics will unveil the splendour of progress in the field in India and all over the world. The stage will be set for mutual exchange of technologies and commerce. There will be good exchange of ideas from abroad but India will show case its own progress. The lead team is leaving no stone unturned to make it a grand spectacle. Hard thinking and ambitious ideas will sizzle in the event. Do you want to pitch in?*

*Get on the phone. Now or E-mail your ideas to OTAI-Western Zone. Hurry. Time is running out.*



# Trade & Commerce

## DISTRESSING

**45% of farmers want to quit farming  
Swaminathan**

Prof M.S. Swaminathan, the father of Green Revolution and Chairman of National Commission on Farmers (NCF) that called for revamp of policies to revitalise agriculture, says agricultural sector in India is entering a state of serious crisis.

Quoting figures from National Sample Survey Organisation, he says half of the farmers in the country want to quit farming. Prof Swaminathan, who was here to deliver the Convocation Address at the Acharya N.G. Ranga Agriculture University here on Thursday, called for the creation of specific mitigation policies for each of the 128 agro-climatic zones. In an interview, he speaks on the current problems Indian agriculture faces and possible solutions to tackle them.

Farmers continue to commit suicide. Hundreds of tenant farmers are reported to have committed suicide in the last few days. Why this crisis continues to haunt farmers?

We are entering a state of agrarian crisis. This crisis has many dimensions. It is not a single or simple cause that is responsible for this. There is the problem of high investments in some crops. There are problems peculiar to rain-fed and irrigated lands. Farming has become unviable. The NCF has recommended cost of production plus 50 per cent. At present, they are giving 15 per cent more as against manifolds more in other industries such as pharmaceuticals.

Probably, the Food Security Act would force the Government now to look at this issue seriously. Unless we revitalise farming and make our farmers enthusiastic it is difficult to feed 100 crore people and 100 crore farm animals. It is going to be a difficult period.

Youth are shying away from agriculture. Why is this happening and how do we make them look

at farming as a profession?

If farmers are committing suicide, why should they come to farming? Farming sector is facing a number of problems. Unless we attend to them, the younger generation will not take to farming. I have asked the students to look at different aspects of agriculture in order to bring in technology and value addition into the system. Besides, we need to minimise risks and increase support services such as insurance and credit.

For different reasons more and more farmers are moving out of farming activity. Reports of shift in land use patterns from agriculture to non-agriculture are also causing a serious concern. How do you view this problem?

About 45 per cent of farmers interviewed by National Sample Survey Organisation wanted to quit farming. The pressure on land is increasing and average size of land holdings is dwindling. Farmers are getting indebted and temptation to sell prime farm land for non-farm purpose is growing as land prices go up steeply. We need to improve productivity and profitability of small holdings.

How is climate change going to impact agriculture sector and what could be the strategies to minimise risks?

We need to set up Climate Risk Management Research and Training Centre in each of the 128 agro-climatic zones. We also should evolve policies for each of these zones and develop codes for drought and flood management.

Calamity relief mechanism too needs a change. The traditional way of sending Central teams to assess the damages and bargain with States on relief will not work. This is not a way to deal with calamities. Money never reaches farmers on time to invest in the next cropping season.

Tenant farmers seem to be the worst hit as crisis hits agriculture sector. How do you view this problem and what are your suggestions to overcome this?

It is a very serious problem. Tenancy reforms need to get focus as part of agrarian reforms. The issues of owner cultivation, tenant cultivation, absentee landlords should get immediate focus. They should have a security of tenancy. Also, we are seeing increase in contract cultivation. This also requires changes in regulation. It must be a win-win situation (for owners and producers).

We need to have new systems of management. We need to put all pieces together. We don't have an integrated approach. In the West, they call it farm to fork. So many Ministries and departments are there to take care of water, rainwater, foodgrains and food processing. How are we going to deliver it as one offering to farmers would hold the key.

None of these problems are insurmountable. They are problems created by us and we can find solutions. It is right time to abandon indifference to agrarian problems.

The Hindu Business Line, 31st December, 2010.

(Courtesy : AICOSCA Newsletter, December, 2010).

## “DO YOU KNOW”

**Godrej consumer products Q2 profit grows to Rs. 131 Cr**

FMCG players Godrej Consumer Products (GCPL) reported a net profit of Rs.131 crore for the second quarter ended September 30,2010.

The company had a net profit of Rs.83 crore in the quarter ended September 30,2009, Godrej Consumer Products said in a statement.

The company also said its board of directors has declared a second interim dividend of Re 1 per share for the financial year 2010-11.

During the period under review, the company's net sales stood at Rs.575.59 crore in the corresponding quarter last fiscal. The company said figures for the current quarter are not comparable

with those of the corresponding quarter of the previous year because of the acquisitions made by the company since then.

“Enhanced penetration and improved volumes have driven our sales growth. Continuing focus on optimizing our category mix is also enabling us to improve our profitability,” GCPL Chairman Adi Godrej said.

The company's international operations have also performed strongly during the period, he said.

The company is eyeing acquisitions and in the next 12 months, we hope to complete some,” he said.

The FMCG major is scouting for acquisition opportunities all over the developing world besides India, the company's chairman said.

(Courtesy : Soaps, Detergents & Toiletries Review/December 2010)

## TAKE GOOD CARE

**Historic food safety & child nutrition laws in US**

THE ailing US food safety system moved closer to towards its biggest overhaul in more than 70 years after the House of Representatives passed legislation that would increase inspections and give regulators the power to recall tainted foods. The Bill, named the PDA Food Safety Modernisation Act, would empower the US Food and Drug Administration (FDA) to order a food recall when a company refuses the agency's request to do so voluntarily. It requires the FDA to inspect food facilities more often, expand its access to food facility records, and requires food producers and processors to identify possible hazards and develop prevention plans. The legislation also aims to make imported food safer by calling for more inspections of foreign food production facilities and requiring importers to verify the safety of foreign suppliers and imported food.

The legislation would be the largest overhaul of US food safety laws since 1938, when Congress gave the FDA the authority to give the safety of

food, drugs and cosmetics. Since then the food supply has grown into a vast network dependent on more fresh foods and imported products, but oversight laws have largely failed to keep pace.

This is a big victory for consumers that finally brings food safety laws into the 21st century," said lean Halloran, the director of food policy initiative at Consumers Union. "For a long time we have been saying that we needed to do a better job of making sure our food is safe, and under this Bill, we will," she said.

In yet another significant move President Barack Obama has signed the Healthy, Hunger-Free Kids Act into law. Flanked by cabinet officials, top Democrats, and schoolchildren, Obama said that "across the country, too many kids don't have access to healthy meals." The Healthy, Hunger-Free Kids Act will expand the number of children in school lunch programmes by 115,000. increase the reimbursement rate to school districts for meals by six cents, and replace the "junk" food available outside the cafeteria, such as in vending machines, with more healthful options. The \$4.5 billion expansion of the school lunch programme, which feeds 16 million children, gained bipartisan support in the Senate. yet initially stalled in the House before passing mostly along party lines.

"Today is a great day for kids throughout our country as they will soon have healthier, and more nutritious food in their schools," said US secretary of agriculture Tom Vilsack. 'As we continue to focus on the twin issues of childhood obesity and hunger, we will increase access to good, quality meals in school cafeterias so the nutritional needs of our youngsters are better met. The President and First Lady have advocated strongly for passing the Healthy, Hunger-Free Kids Act of 2010, and this Bill, along with the resources and the powers provided under it, are going to allow US FDA to be much more effective and aggressive in responding to obesity and hunger challenges for America's kids."

In India, more than 30-35% of our population, especially, children below 5 years are malnourished. Child nutrition is a major concern for our planners, but are handicapped by the sheer size of the problem. Feeding a population of 1.2 billion

is a gigantic task and the UPA government's efforts to bring in a Food Security Act has met with roadblocks. India's mid-day meal programme in schools is the biggest in the world, but is mired in corruption. As the country boasts of 9% GDP growth, it is of paramount importance that we look into food security, food safety and child nutrition. While half of India lives in ostentatious luxury, we cannot allow the other half to go hungry and malnourished.

pn vnair@saffronmedia.

(Courtesy : *Ingredients South Asia*, 1-15  
January 2011)

## "THE SOAP OPERA"

**Soaps business holds the key to go's prospects**

### **JWALIT WAS & KIRAN KABTTA SOMVANSHI**

Hindustan Unilever's (HUL) strategy to launch new products in existing categories with higher promotional budget appears to have worked. The company reported substantial improvement in overall sales volumes and margin for the September 2010 quarter. In fact the numbers were the best in the last three quarters.

Though on a year-on-year basis, HUL's numbers were lacklustre, what caught the Street's attention was a better rate of growth in volumes and operating profits compared with the previous quarter's growth. Volumes, for instance, rose 14% in the September quarter from the year-ago level. This was better than the 11 % growth in the June quarter. Also,, operating margin before depreciation was 16.3% as against 15.5% in the last quarter. The performance of the soaps and detergents business, the segment contributing almost 45% to HUL sales, has long remained a sore point for the company. This is because of the difficulty to pass on the full impact of rising raw material costs to consumers. In the September quarter, however, it increased prices of products in the category. This resulted in a higher year-on-year growth in sales and better margin compared with the previous quarter. Other revenue segments for HUL in-

clude home products (28.7%), beverages (12%) and processed foods (4.6%), Compared with the year-ago quarter, the sales growth in the home products and processed food segments has been good but not as impressive as the soap & detergent and beverages categories. This can be mainly attributed to the highly competitive nature of the industry and slow industry growth. In terms of segment-wise net profits; of the four categories, only processed food category has shown increase in profitability. Despite growth in sales, the remaining categories have showed decline in profits mainly due to higher input costs. This explains the 170 basis points decline in the overall operating margin. Despite lower operating margin, net profit grew by 32% mainly due to one-

time item, which includes the sale of property. Going ahead, food inflation is likely to ease given the better monsoon season. This should aid profitability and increase the company's topline. The company's stock increased by 1.4% after the results announcement. In the last two months, It has increased 14.5%. Given that HUL's earnings per share has remained stagnant over the last few quarters, the stock's current valuation seems to have factored in the possible future growth. While the company has delivered improved numbers in the September quarter, the performance of its soaps and detergents business will determine the extent i its future turn around.

*(Courtesy : Soaps, Detergents & Toiletries Review/December 2010)*

# Technology

## INTERESTING

### New Developments in Cotton Technologies

By

**Fred Bourland**, University of Arkansas, USA

COTTONSEEDS were once considered as a byproduct of cotton fiber production. Now, cottonseeds are important sources of oil and protein. However, utilization of cottonseed has been hindered by the present of gossypol, which renders the seed inedible by non-ruminant animals. Considerable work in the 1970's led to the development of glandless cottons. These glandless cottons did not accumulate gossypol in glands that are associated with most plant parts. However, the removal of these gossypol glands made the plant vulnerable to a wide array of insects and pests that feed on leaves and stems.

Using biotechnology, Texas A&M University has now developed cotton lines that produce glandless seed on glanded plants. This technology may further increase the value of cottonseed and help to address the protein needs of millions of hungry people now and into the future. Gin trash was also once considered as a byproduct of cotton production and was usually burned. New technology is now being developed to greatly expand the use to gin trash.

These include:

- \* Recycling back into the soil as a mulch on fields/gardens or as mushroom compost
- \* Mixed with water and grass seed and sprayed on the sides of roads to control erosion
- \* Pressed into briquettes to be burned as fuel
- \* Slathered on walls for noise control
- \* Mixed with construction materials and used to make decking for homes
- \* Used for the inner lining of bathtubs and other containers.

*(Courtesy : AICOSCA Newsletter, November, 2010)*

## SEARCH

### Lack of Research-fit Development effort in cottonseed and cottonseed processing

HUGE amount of Research work is being carried out on cotton not only in India but all over the world. However, it is conspicuous by its absence in case of cottonseed even though it forms two third portion of the seed cotton. We are more interested in immediate research work on removal of Gossypol from cottonseed meal which will open flood gates of demand both within and outside the country especially as poultry feed & fish meal. All over the world cattle feed is assessed on the basis of protein contents. However, in India the preference is for oil content in spite of the fact that research results glaringly reveal that oil in oil cake is of little use to the cattle. Oil is required for generation of energy. The cattle themselves generate the required energy while rumination. Thus we are wasting almost 6 to 7 lakh tonnes of precious cotton seed oil every year. It is a tragic happening in India, that the cottonseed oil cake with protein content as low as 20-22% (6-7 percent oil) is sold on par or at higher rate than cottonseed meal (DOC) with protein content as high as 40 to 42 percent with negligible oil content.

As per the research carried by the National Dairy Development Board (NDDB) Anand. Protein, content in cottonseed meal is of By-pass type i.e it by-passes rumen, i.e. first compartment of cattle's stomach and therefore prevent degeneration and thus the maximum amount of protein is absorbed by the cattle. Education of cattle feeders to use proteinous cottonseed extraction instead of traditional cottonseed cake and adoption of scientific processing by the cottonseed processors is an urgent need in the larger national interest.

*(Courtesy : AICOSCA Newsletter, September, 2010)*



## CURIOUS

### Scientific basis for natural fibres being better than synthetics for clothing

Ever since their advent a few decades ago, synthetic fibres have been offering stiff competition to cotton. Initially, they proved to be attractive because of their easy care and wash and wear properties. Subsequently, quite a number of new synthetic fibres came to be developed through research which entailed huge amounts of investments by chemical industries. Cotton came to lose ground and its market share in the global use of fibres for clothing came down substantially.

However, later on, cotton could regain some lost ground as some of the problems with clothing made of synthetic fibres came to light. It was noticed that they caused skin allergies to some people besides some other minor ailments. Also, cotton's superiority over synthetic came to be better appreciated because of its unique properties such as moisture absorption and weaving comfort. It was the preferred fibre for inner wear garments, kids' clothes, sports wear, etc. More recently, cotton also entered the fashion wear market. Fashion designers came to use cotton, especially finer cottons, for some of their creations. All these enabled cotton to withstand further onslaught from synthetic and could even regain some of the lost market share. It is estimated that presently cotton's market share in the global use of fibres for clothing is around 40 per cent.

It now appears that research undertaken at different centres in countries like Poland and Japan has established the scientific basis why natural fibres are better than synthetic fibres in clothing. The ICAC Recorder of September 2010 carries a detailed article on the subject. Some of the highlights of this article are mentioned below for information.

One of the results from the study of the reactions to human body from the use of synthetic fibres is said to have been that they may lead to a higher tendency to fatigue. Due to the use of considerable amounts of man-made fibres in clothes and bed, bed linen, there are said to have been

more allergies observed among people who use different textile products made from them. Studies conducted in everyday conditions reportedly showed that garments made of natural cellulosic fibres like cotton or linen have a positive influence on physiological parameters of the human body level of immunoglobulin. The lowest level of body temperature and increase of immunoglobulin during sleeping in cotton or linen bedding is said to have proved that such raw materials have a positive influence on human rest and sleep quality. Further, wearing cotton pajamas positively influenced the activity of sweat glands that improve resistance to skin allergies. It is also stated that wearing polyester clothes can be a reason for desynchronisation of muscle motor units and thus, an increase in fatigue among users. Clothing made of natural cellulosic fibres is said to have been found to positively influence the human body ensuring well being without causing fatigue.

(Source : ICAC Recorder September 2010).  
(CAI, Cotton Statistics & News 5th  
October, 2010)

(Courtesy : AICOSCA Newsletter,  
September, 2010)

## AWAIT

### GM soyabean not now : Monsanto

Biotech major Monsanto is testing a Bt (*Bacillus thuringiensis*) corn that offers protection against insects and weeds but it is not looking to introduce genetically modified (GM) soyabean or pulses. The company is also readying to introduce a new variety of GM cotton that incorporates the properties of its Bollgard II and Roundup Ready flex cotton.

"The Bt corn that is being tested now has dual technology. The new cotton variety has characteristics of the Bollgard II and the Roundup Ready Flex," said Dr Gyanendra Shukia, Director, Corporate Affairs, Monsanto India Ltd, in an interview to Business Line.

The reason why Monsanto is not ready to bring in GM soyabean, one of its popular offerings in

the US, is that there is no system in the country that can help the company recover its costs. "Soyabean or pulses or rice are open pollination varieties and hence farmers do not buy their hybrids," he said.

But the company is prepared to bring in these crops as well as know-how in other crops under public-private partnership. "Developing crops under such partnership will help us. We will help develop technology and hand it over to the government. In such circumstances, we will get compensation for our work," he said.

"We are looking at a free market in which the intellectual property rights will be recognised and where the system will favour innovation that will help farmers," Dr Shukia said, elaborating on reasons for not looking beyond the introduction of Bt corn.

On the moratorium announced by the Government on Bt Brinjal, he said it had slowed down research on GM crops a bit. "I don't say that people have stopped research but things are at a point where clarity is required. We hope facts that are scientifically-based will prevail," he said.

Dr Shukia said Monsanto is of the view that there is 'no sense' in making labelling of products manufactured from genetically modified organisms (GMOs) mandatory in India. However, it supports other options such as individuals making a personal decision not to consume food containing genetically modified ingredients or companies voluntarily labelling their products as not containing GMOs.

Pointing out that that the Food and Drug Administration (FDA) of the US has determined that genetically-modified crops do not differ from non-GM crops and products containing GMOS need not be labelled, he said: "FDA does require the product to be labelled if the ingredient is a potential allergen or somehow changes the nutritional properties of the food. "To date, no approved biotech crop is either an allergen, or has any significant nutritional differences from non-GM counterparts. If labelling is made mandatory in India there ought to be proper infrastructure in place for companies to comply with the law," he said.

A GMO is an organism whose genetic material is altered using genetic engineering techniques. These techniques use DNA molecules from different sources that are combined into one molecule to create a new set of genes. This DNA is then transferred into an organism, giving it modified or novel genes.

(The Hindu Business Line, 10th October, 2010).

*(Courtesy : AICOSCA Newsletter, October, 2010)*

## BE NATURAL

**Green trend drives personal care ingredients market**

**Anna Ibbotson**

The natural personal care industry has continued to gain momentum over the past year despite a crippling global recession. Driven by consumer demand not only for natural products but also for sustainable manufacturing processes among brand marketers, the naturals market is expected to maintain a healthy growth rate over the next few years. This is great news for raw materials suppliers who now face a tremendous opportunity to innovate and develop key raw ingredients that not only meet formulators' and consumers' demand for naturalness but also offer the performance required to be on par with their synthetic counterparts.

On a global scale, the natural personal care market is approaching \$300 billion at the retail level, with the BRIC countries (Brazil, Russia, India, and China) and Argentina expanding their share at a rapid rate. In Europe, still the largest region, the natural personal care segment posted nearly 14% growth in 2009, compared to the overall market at just 4%. In the United States, the segment peaked at 8%—still quite robust considering the overall performance in the industry as a whole.

### GREEN IS GROWING

A number of key drivers have converged to spur growth in the natural personal care market from

the consumer, retailer, and brand marketer perspective. These forces make the naturals market quite attractive to ingredients suppliers:

1. Growing environmental awareness among consumers has led to a global shift in their desire, behavior, and attitude toward natural products. Going green is no longer considered an eccentric behavior of a small but highly committed segment of the population. Now, the average consumer has become more aware of his or her impact on the planet and has begun taking steps to reduce that impact wherever possible.

2. Innovative product development in the naturals category has made green products more widely available, fueling consumers' demand for more environmentally friendly products. As green products become more accessible and affordable, it becomes much easier for consumers to adopt them as a viable alternative to traditional synthetic formulations.

3. Mainstream acceptance of organics and "locavore" eating habits, whereby consumers source food products from their local region, has also prompted greater interest in natural personal care products. As consumers strive to avoid pesticides as well as synthetic growth supplements in their food, they have also begun reducing the incidence of other synthetic chemicals with which they come into contact.

4. Media hype and marketing have also played a significant role in the growing green trend. The powerful combination of brand marketing tactics, retail promotions, celebrity endorsements, and widespread media coverage has reinforced consumers' awareness of and desire for more sustainable products and practices. In Europe, where regulation under the REACH [Registration, Evaluation and Authorization of Chemicals] act makes available the certification seal for products that meet certain requirements, this adds to the marketing appeal of natural products. As a result of these factors, major global marketers have stepped up efforts to meet consumer demand and capitalize on the market opportunity, as evidenced by key acquisitions that have brought some niche naturals brands mainstream. Estee Lauder's string of acquisitions that began with Aveda in 1997 has made the company a naturals power-

house in the personal care market. L'Oreal, Colgate-Palmolive, and Clorox have also recognized the potential, throwing the power of their mega-marketing machines behind previously unknown small brands such as Tom's of Maine and Burl's Bees.

## THE PROBLEM OF PERFORMANCE

Amid all of this attention, suppliers are working overtime to develop natural ingredients to meet the demand. While great strides have been made in some ingredient categories to deliver the natural positioning and the performance required, some categories remain a challenge.

- Specialty surfactants. Of the \$600+ million specialty surfactants market, only about 10% of the raw ingredients available in this category are naturally derived. Natural alternatives for these products, which reduce skin and eye irritation of commodity surfactants and boost foaming properties in hair and skin-care rinse-off products, are gaining traction particularly in the mass-market product categories. Growth in the naturally derived segment is expected to reach nearly 4% CAGR (compound annual growth rate) through 2013. The leading product in this segment is alkyl polyglucosides (APG), supplied by Cognis (the market leader), Clariant, and Croda.

APG are manufactured from plant-derived materials such as vegetable oils and starch.

- Specialty emollients. Among the most widely used ingredients in personal care, emollients are effective in facial creams and cleansers, wipes, and other skin-care products for their moisturizing, softening, and anti-aging properties. Here, naturally derived products have a stronger share at just over 50% of the market, which totals in excess of \$400 million, and this market is expected to grow by more than 3.5% CAGR through 2013. By their very nature, these ingredients are more readily available, accessible and affordable to derive from natural sources, such as mineral and vegetable oils, and there is a general movement in the industry away from synthetics and animal-based ingredients (such as lanolin).

- Conditioning proteins. Similarly in conditioners, there is a strong shift away from animal-based

to plant-derived proteins for the likes of skin and hair products. Now more than 60% of the conditioning market consists of plant-derived products, supplied in large part by Croda and Cognis, the clear market leaders. Despite their broader acceptance, botanical proteins remain less economical to produce leading many manufacturers to consider fish-based proteins as possible alternatives, as well as milk- and silk-based proteins, which have also shown some potential.

- Hair fixative polymers. Even more than surfactants, fixative ingredients used in hair sprays and other hair styling products prove to be a significant challenge when it comes to developing an effective, viable natural alternative. Synthetics, such as vinyl, acrylic, and polyurethane polymers, make up 99% of the active ingredients on the market. It seems that, with the possible exception of cornstarch-based formulas, devising the fixative properties from natural ingredients to meet the hair-styling demands of consumers is a formidable challenge.

- Substantiated specialty actives. Members of this unique class of ingredients, backed by scientific testing, are 100% naturally derived and used by formulators specifically to make performance claims in the skin-care product category. Driven largely by the demand for anti-aging properties, this category is expected to post a healthy CAGR of 7% over the next three years as the enormous baby boomer population turns to these products to stave off the signs of aging. These ingredients, including peptides, bio-tech actives and enzymes, and their associated claims are key to formulators in the luxury, high-end mass market, professional, and specialty trade classes as they cater to this mature population, which typically enjoys a higher level of disposable income.

## INNOVATION IS THE KEY TO GROWTH

The growth in the naturals market presents a unique opportunity for raw ingredients suppliers to carve out a strong position as a leader in this industry. To do so would likely require a blockbuster R&D [research and development] breakthrough to discover and develop a viable natural alternative to one of the more vexing performance issues, such as surfactants or fixatives. While just about every player in the supplier market has

built a “green” portfolio, much work remains to be done to solve the problems of performance, availability, and pricing that make the naturals proposition a significant barrier, especially in the hair-care and cleansing product lines.

With the naturals trend well-entrenched around the globe, ingredients suppliers are eyeing the burgeoning opportunity in the Asia-Pacific region. Some, Cognis included, have already established production facilities, particularly in China, to leverage the anticipated growth here and compete directly with local domestic suppliers.

As suppliers and formulators strive to reduce the amount of “science” in their products to achieve a more natural slant, there is an overall movement toward a more collaborative, interactive relationship. Working together to develop multifunctional ingredients that solve multiple performance challenges not only helps reduce the number of ingredients in the product, which imparts a more natural position, but also works to reduce the overall cost of production—which benefits both parties, as well as, ultimately, the consumer.

Anno Ibbotson (Anna.Ibbotson@klinegroup.com) is industry manager with K/line & Company. Reprinted with permission.

*(Courtesy : inform, November 2010, Vol. 21 (11))*

## “NEVER SAY NEVER”

### JATROPHA

#### Second thoughts on jatropa in India

India established a mandate in 2009 that by 2017 it would be able to supply at least 20% of its oil consumption with home-grown biofuels. To this end, the government has been encouraging the cultivation of *Jatropha curcas* as a source of biodiesel feedstock.

The Inter Press Service (IPS) reports, however, that Suneel Parasnis, Asia coordinator of Private Financing Advisory Network, said, “Biofuels have failed because of unavailability and high price of

stock feed for biodiesel processing plants all over India.”

Federal planners in India initially bought into the idea that jatropha can grow well and produce oil-rich seeds when grown on waste land. The idea was attractive because it avoids the question of using land for growing food vs. growing fuel. In 2003, potentially 36 million hectares of land were identified as being ideal for jatropha growth in India, much of it government waste and forest land, land in railroad rights of way, and in hedges and windbreaks around private farms.

In response to governmental land and tax incentives, many Indian farmers and oils companies were growing jatropha by 2006. Enthusiasm has waned, however, as farmers have found that jatropha produces better yields on fertile, irrigated land. Application of fertilizer increases yields still further.

Smallholders are finding that jatropha can survive on “waste” land, but not in volumes that produce enough yield to support the needed inputs. Another issue is impatience. The IPS interviewed K. Kotesh-war Rao of Nandan Biomatrix Ltd. (Hyderabad, India), which has developed patents on higher oil-yield genotypes of jatropha. He said, “One of the biggest problems is having farmers pull out of jatropha before fruit-bearing starts by the third year.... For the next 35 years they need only tend and harvest but they run out of patience.”

The report is available at <http://ipsnews.net/news.asp?idnews=52890>.

*(Courtesy : inform, November 2010,  
Vol. 21 (11))*

## BEWARE

### Organic hair care claims misleading

The UK's Advertising Standards Agency (ASA) has ruled that an advertisement for hair care products described as “naturally organic” was “likely to be misleading” to consumers.

The magazine ad for US-based natural and organic beauty brand Simply Organic contained the

claims “Simply Organic” and “Naturally Organic.” These claims were challenged by Herb UK, which argued that they were misleading because “they implied the products met an independent organic standard.”

After studying a response from Simply Organic, including the submission of documentation and certification from some US-based certifiers, the ASA upheld the complaint.

While noting that the US organic certification provided by the advertisers covered a list of ingredients, the ASA said it had not seen any documentation that set out which ingredients were used in the Simply Organic product range, or that showed whether those ingredients were covered by the certified list. The Agency also noted that a certificate of analysis provided by the advertiser was out of date, concluding that “the status of the advertised product range was unclear.”

The ASA has instructed the company not to use the ad again in its current form.

*(Courtesy : inform, November 2010,  
Vol. 21 (11))*

## THE REVERSE

### Method for producing phospholipid

Sakai, M., et al., Kabushiki Kaisha Yakult Honsha, US7695944, April 13,2010.

A method for producing a phospholipid using transphosphatidylation, which comprises homogenizing a mixture of a raw material phospholipid, a hydroxyl-containing acceptor phospholipase D, and water in the absence of an organic solvent to obtain a homogenized mixture; and subjecting the homogenized mixture to a transphosphatidylation reaction at 15-65°C. The homogenized mixture has a lamellar lyotropic liquid crystal structure. An objective phospholipid can be obtained from the homogenized mixture through transphosphatidylation without using an organic solvent or calcium.

*(Courtesy : inform, November 2010,  
Vol. 21 (11))*

## KNOW HOW

### Biodiesel production from *Jatropha curcas*: A review

Parawira, W., Sci. Res. Essays 5:1796-1808, 2010.

Biodiesel has attracted considerable attention during the past decade as a renewable, biodegradable, and nontoxic fuel alternative to fossil fuels. Biodiesel can be obtained from vegetable oils (both edible and nonedible) and from animal fat. *Jatropha curcas* Linnaeus, a multipurpose plant, contains high amounts of oil in its seeds that can be converted to biodiesel. *Jatropha curcas* is probably the most highly promoted oilseed crop at present in the world. The availability and sustainability of sufficient supplies of less expensive feedstock in the form of vegetable oils, particularly *J. curcas*, and efficient processing technology to biodiesel will be crucial determinants of delivering a competitive biodiesel. Oil contents, physicochemical properties, and the fatty acid composition of *J. curcas* reported in the literature are provided in this review. The fuel properties of *Jatropha* biodiesel are comparable to those of fossil diesel and conform to the American and European standards. The objective of this review is to give an update on the *J. curcas* L. plant, the production of biodiesel from the seed oil and research attempts to improve the technology of converting vegetable oil to biodiesel, and the fuel properties of the *Jatropha* biodiesel. The technological methods that can be used to produce biodiesel are presented together with their advantages and disadvantages. The use of lipase as biotechnological solution to alkali and acid catalysis of transesterification and its advantages are discussed. There is need to carry out research on the detoxification of the seed cake to increase the benefits from *J. curcas*. There is also need to carry out life-cycle assessment and the environmental impacts of introducing large-scale plantations. There is also still a dearth of research about the influence of various cultivation-related factors and their interactions and influence on seed yield. Many other areas that need to be researched on *Jatropha curcas* L. are pointed out in review.

*(Courtesy : inform, November 2010, Vol. 21 (11))*

## NOW, AIRCRAFT

### Biofuel could be cleared for aircraft use

Graham Warwick

IN just five years, the aviation industry's decades-long reliance on petroleum-based fuels has been turned on its head. The future lies in fuels from sources that range from animal fat to microal-gae. But with the technology in hand, the question now is whether biofuel producers can raise the investment needed to launch commercial-scale production.

Approval of biofuels for use in aircraft, expected by mid-2011, is a critical step. A standard for jet fuels using synthesized hydrocarbons has already been crafted and the first annex, covering synthetic paraffinic kerosene (SPK) produced via the Fischer-Tropsch (F-T) process, was approved last year. But a second annex covering bio-SPK—also called hydrotreated renewable jet fuel (HRJ)—is eagerly awaited, as these promise to reduce aviation's greenhouse gas emissions.

For an industry that has used one jet fuel for decades, development of the new D7566 specification by standards organization ASTM International has moved surprisingly quickly. But it has not been easy, requiring substantial fuel and engine testing to ensure synthetic kerosenes are truly drop-in replacements for petroleum-based jet fuel.

As expected, the proposal to amend D7566 to include bio-SPK did not pass a ballot of ASTM members in June. Opponents, mainly the engine manufacturers, argued that more data are needed on different fuels from different manufacturers and more engine testing is required. One reason is that most of the fuel tested came from Honeywell International's UOP, which won a Pentagon contract to supply HRJ for qualification testing, says Tim Edwards, who is leading biofuels research at the US Air Force Research Laboratory (AFRL; Wright-Patterson Air Force Base, Dayton, Ohio).

After the vote, the Air Force agreed to share fuel to allow additional commercial engine demonstrations. The service is also conducting biofuel

tests on military derivatives of commercial engines, which will help with certification. These include flight tests of the FI 17 derivative of Pratt & Whitney's PW2000 turbo-fan on the C-17 airlifter. An aircraft flew in August with all four engines fueled by a 50:50 blend of conventional JP-8 and HRJ [made from] from beef tallow.

Data from the additional fuel and engine testing will be presented to ASTM members, and a re-ballot in December 2010 is expected to succeed. This should lead to approval early next year of an annex to the D7566 synthetic-fuel standard allowing bio-SPK to be used in aircraft in blends of up to 50% with conventional jet fuel. This will be a pivotal event, as certification is expected to remove a significant barrier to investment in large-scale facilities to produce HRJ fuels in economic quantities.

"Nothing matters until you get that approval," says Tom Todaro, chief executive officer (CEO) of AltAir Fuels (Seattle, Washington, USA) and chairman of the board of Sustainable Oils (Bozeman, Montana, USA), which produces oil from camelina, a plant that largely does not compete with food crops for land or water. "The problem is the availability of financing, not camelina. We can't get the money until the fuel is certified," he says.

AltAir Fuels is the first to license UOP's process to produce HRJ. The Seattle-based company signed memorandums of understanding with 14 airlines in December 2009 to negotiate the purchase of up to 750 million gallons (2,800 million liters) of camelina-derived fuel. This is to be produced at a facility in Ana-cortes, Washington, and would replace about 10% of the fuel consumed annually at Seattle-Tacoma International Airport. "Once ASTM approves the fuel, we can begin the permitting process," he says, adding that construction will take 18 months.

The creation of AltAir illustrates the challenges of starting biofuel production. Sustainable Oils works by signing contracts with farmers to grow camelina that it will buy back at an agreed price. Farmers grow a specific strain of camelina developed by biotechnology company Targeted Growth. Sustainable Oils extracts the oil from camelina seeds, "but we hoped someone else

would build the refinery," says Todaro.

Eventually, to kick-start the market, Sustainable Oils decided to form AltAir as an independent company. The business plan is to build add-on units at traditional refineries. With 100-million-gallon capacity, these bolt-on facilities will each cost "a couple of hundred million dollars" and provide about 10% of the fuel required annually at an average-sized airport, he says.

While the near-term focus is on plant oils and animal fats as feedstocks, aviation is enamored of algae because it promises high oil yields from small land areas and does not compete with food for land or water. Work is underway scaling up algae production in both open ponds and closed bioreactors, in a bid to drive down costs, but San Francisco-based Solazyme says it is ready to move into commercial-scale oil production using a different algae pathway (for more information on Solazyme, see inform 27:373-375,2010).

Solazyme has adapted the fermentation process used to produce ethanol, replacing yeast with algae. Sugars produced from a wide range of feedstocks—switchgrass, corn stover, sugar cane, municipal waste, and cellulosic biomass—are fed to the algae, which convert the sugar to oil. The oil is then extracted from the algae and converted to HRJ using UOP's process. Solazyme has delivered 1,500 gallons of algal HRJ to the US Navy for engine testing.

The company says it is on track to be cost-competitive with petroleum-based fuel in 18-24 months, targeting \$60-\$80 a barrel. "We should be producing quantities that can fill some demand in the aviation market in the next three years," says CEO Jonathan Wolfson.

Solazyme is talking to airlines about long-term supply agreements and to refining partners about establishing a supply chain. "We are working with numerous partners to provide a rapid path to commercialization that includes access to feedstock and financing," he says, noting the addition of US agribusiness Bunge as a strategic investor "is an indicator of how we are thinking about feedstock ... we are confident that the supply will be there."

After playing a key role in the rapid progress of

biofuels from idea to reality, UOP is turning its attention to new processes and feedstocks.

“We’ve made [bio-SPK] fuels from about 12 different types of natural oils,” says Jim Rekoske, vice president and general manager of UOP’s renewable energy business. “We are confident we can look at an oil and say what yield of jet fuel you will get from that feedstock.”

UOP’s process “is completely feedstock flexible,” Rekoske says, and can convert any natural oil with hydrocarbon chains of appropriate lengths into jet fuel. “A flexible process allows you to source the cheapest available oil.” The challenge now, he says, is in bringing together three different industries—agriculture, refining, and transportation—to reach long-term agreements that will provide the confidence needed to scale up feedstock and fuel production. “That’s the process that is taking time.”

Feedstock flexibility will allow an HRJ fuel producer to switch to a higher-yield feedstock. “If the question is, do you want to invest in growing camelina if you can be supplanted in five years by algae, the answer is long-term agreements with customers and refiners. It’s just negotiation,” says Rekoske. He believes there has been significant progress, with two groups close to definitive supply agreements with airlines.

With approval for bio-SPK now within sight, interest is shifting to more advanced biofuels, and there is growing excitement—and debate—over which pathways will be next to be approved. “Part of our work is to figure out what is next, what’s the most mature,” says AFRL’s Edwards. “It starts with people sending us fuels. We’re working on different feedstocks, different processes, and fully synthetic fuels.”

Much of the work is focused on processes for producing jet fuel from ligno-cellulosic feedstocks such as forest, agricultural, and municipal waste, which is available in huge quantities. UOP is working on upgrading pyrolysis oil to liquid fuel. Fast pyrolysis is the rapid decomposition of biomass in the presence of heat and absence of oxygen. The resulting bio-oil can be upgraded to fuel. “We are looking at a variety of different things for next-generation fuels. But there is a tremendous ca-

capacity to supply natural oils without going to biomass and other carbon sources,” argues Rekoske.

One of the most promising new pathways, Edwards says, is being called “alcohol oligomerization.” This starts with an alcohol, like ethanol or butanol; removes the oxygen; and grows hydrocarbons from the molecules. Gevo, Virent, and Swedish Biofuels are among the companies working on this “catalytic renewable jet” pathway. Brazilian biotechnology company Amyris, meanwhile, is pursuing an advanced fermentation process that goes direct from cellulosic biomass to liquid fuel using specially tailored microorganisms.

Richard Altman, executive director of the Commercial Aviation Alternative Fuels Initiative, says the catalytic, fermentation, and pyrolysis renewable jet pathways are competing to be the next process approved by ASTM in the 2013 timeframe. ASTM, meanwhile, has formed a task force to look at fully synthetic fuels, called SKA, for “synthetic kerosene with aromatics.”

Synthetic paraffinic kerosenes are limited to 50% blends by the need for aromatic hydrocarbons found in conventional jet fuel, but synthesized aromatics—or changes to engine seal materials—could allow 100% synthetic fuels. “We are doing a lot of work on fully synthetic fuels,” says Edwards. Honeywell and the FAA are working to determine by 2013-2014 the minimum aromatics required in engines, says Rekoske, adding that “100% synthetic is still the goal.”

Graham Warwick is senior editor, technology, for Aviation Week. He can be contacted via email at [warwick@aviationweek.com](mailto:warwick@aviationweek.com). Reprinted with permission.

*(Courtesy : inform, December 2010, Vol. 21 (11))*

## “JATROPHA ALIVE & KICKING”

**EU to build jatropha processing plant in Ghana**

THE European Union (EU) announced a project to produce bio-energy at Walewale, in the West Mamprusi District of Ghana, on October 7. The



project is funded (•2 million) for five years. Unfertile lands in the Wale-wale area will be planted with jatropha, and the seeds will be processed in-country to obtain crude oil and by-products.

According to Giuseppe Enne, project coordinator of the Ghana Jatropha Project and the Nucleo Ricerca Desertificazione of the Università de Sassari (Italy), an “appropriate and cost-effective expeller for jatropha oil extraction” will be constructed (<http://ghanaian-chronicle.com/?p=8812>). Several governmental and non-governmental organizations within the country are collaborating with the Ghana Jatropha Project to implement the plans.

The project aims to improve Ghana’s sustainable renewable energy, to create income-generating activities, and to mitigate land degradation effects in rural area in the country.

San Nasamu Asabigi, Deputy Northern Regional Minister of Ghana, said jatropha could be an alternative to reduce the energy crisis facing the country. He added, “About 69% of the total energy consumed in Ghana is from the already depleted forest, 10% from electricity, and 21% from imparted petroleum.”

## JATOIL SHIPMENTS

### Jatoil schedules regular shipments<sup>^</sup> of crude jatropha oil

AFTER purchasing more oil-producing fields, Jatoil Ltd. (Pymont, New South Wales, Australia) announced plans in October to make regular weekly shipments of crude jatropha oil from its plantations in Central Java (Indonesia) to a power station customer in the Netherlands. The company’s 70%-owned joint venture (JV), PT Jatoil Waterland, purchased an additional 522 hectares (ha) of three- to four-year-old jatropha trees near its 1,000 ha plantation, which in July produced Jatoil’s first shipment of second-generation biofuel for a consortium of airline companies for use in commercial operations (inform 27:555, 2010). A company statement indicated the acquisition of these additional hectares effectively doubles the JV’s current capacity of 700 metric tons over the next 12-18 months.

## MEXICO TO JATROPHA

### KUO Group signs agreement for bioenergy

ANTONIO Brufau, chairman of Repsol, an integrated international oil and gas company headquartered in Madrid, Spain, and Fernando Senderos Mestre, chairman of the KUO Group, one of Mexico’s largest conglomerates, signed an agreement on October 28 to create a joint company called Kuosol, dedicated to the development of bioenergy from the cultivation of Jatropha curcas,

Both Repsol and the KUO Group will have a 50% stake in Kuosol; the total investment is estimated at \$80 million. The headquarters of Kuosol will be in Mexico, and its activities are envisioned to range from farming to industrial installations. Its main objective will be to use integrated biomass plantations of 7. curcas oil to generate biofuels and bioenergy in a sustainable manner.

In 2008, the KUO Group began a pilot project in the Yucatan state of Mexico to produce bioenergy from nonedible second-generation crops on land not suitable for agriculture. The first phase was developed with more than 300 hectares of J. curcas oilseeds to obtain an oil to produce biodiesel. The project allows the KUO Group to harness vacant lots formerly used for pork-raising, to reuse recycled water, rich in nutrients, for irrigation on its farms, and to provide easy access to carbon credits under the Clean Development Mechanism (CDM) of the 2007 Kyoto Protocol.

The immediate objectives of the Kuosol company are (i) to plant and cultivate 10,000 hectares of jatropha in Yucatan, Mexico, principally on third-party lands; (ii) to harvest 44 million liters of crude oil for bio-fuels; and (iii) to develop an integrated use of biomass from forest plantations, cogeneration of steam and electricity for self-supply, with surplus production sold.

It is estimated that agricultural development will be completed in the next three years, allowing industrial production to st§ in 2013.

*(Courtesy : inform, December 2010, Vol. 21 (11))*

## DARE IT

### Detergent industry faces the future

**Catherine Watkins**

THE French proverb suggesting that the more things change, the more they stay the same could be applied to the seven AOCS World Conferences on Detergents held in Montreux, Switzerland. Although the speed of change in 2010 is exponentially faster than the speed of change in 1977 when the first conference was held, many of the business realities facing the global fabric and home care industries remain the same.

Regulatory and environmental pressures, availability and pricing of raw materials, poor margins, the fickle consumer, a volatile economic environment, mature markets, the perpetual search for innovation—these are constants of the industry that have not changed over the years. Nonetheless, in light of the global focus on sustainability by both consumers and regulators, everything has changed.

Held October 4-7, 2010, the Montreux meeting was billed as providing “New Strategies in a Dynamic Global Economy.” Indeed, the “new normal” of recession and volatile commodity costs figured prominently during the three-day meeting, as did sustainability, innovation, collaboration, and the promise of emerging markets.

### **BIG BUSINESS**

Annual retail sales for the global laundry care category have reached \$65 billion, Bill Schmitz of Deutsche Bank told participants, comprising \$49 billion in detergent sales, \$9 billion for fabric softeners, and \$6 billion for laundry aids.

For consumer products companies like The Procter & Gamble Co. (P&G), the laundry care category represents a significant percentage (30%) of revenue. But the industry is under pressure, P&G head Bob McDonald noted: Annual growth decreased to 4% in 2009, compared to 5% the previous three years; established brands in North America lost market share to private la-

bel brands during the recession; commodity and supply costs are unpredictable; and regulation has toughened.

Nonetheless, participants and speakers alike remained upbeat. Despite slow growth in developed markets, opportunities abound in developing countries such as China and India. Latin America is a more difficult challenge because of loyalty to local brands.

“Developing markets were the only place in the world last year where growth in the laundry segment was acceptable,” Schmitz noted. Automatic washing machines are gaining traction in China and Eastern Europe, he added, but competition among product manufacturers in emerging markets is “brutal.”

Looking to the future, Schmitz found that there is still room for global consolidation in the laundry market. “The top three players could control over 60% of the market in the next five years,” he said. Perhaps the greatest challenge for the industry is “discontinuous innovation, which opens doors for private label” goods, Schmitz said. “The lasting solution is innovation,” he concluded.

Also sounding the call for innovation was Chris DeSoiza, vice president of Milliken Research Corp. (Spartanburg, South Carolina, USA), who spoke about the future of the textile business. Seven cents of every dollar spent globally is on clothing/textiles, he said; Asia is the number one consumer of textiles and apparel. Furthermore, developing countries produce more than 60% of all apparel and textiles.

Textile trends that DeSoiza feels will affect fabric care include customized three-dimensional printed apparel as well as electroluminescent materials or stimuli-sensitive polymers. A technology developed by Milliken for food service uniforms, called BioSmart, could be extended to other markets. When clothing treated with the Bio-Smart process is laundered with chlorine bleach, receptor sites bind the chlorine to the surface of the fabric, killing bacteria on contact.

### **SUSTAINABILITY HOW-TO**

Kasper Rosted’s call for “truly sustainable busi-

ness models” was answered in part by Martin Wolf of Seventh Generation, Inc. (Burlington, Vermont, USA). As the company’s director of product sustainability and authenticity, Wolf provided a sustainability how-to for attendees. (Seventh Generation is a self-declared “socially responsible” company that produces a variety of household, laundry, and cleaning products.)

“We look at the supply chain to understand where our materials are coming from, focusing first on palm kernel oil sustainability,” he noted. But the company goal is not just sustainable products but rather sustainable relationships, governance, social justice, and equity.

Several speakers examined how the Japanese culture approaches eco-consciousness. Emile Ishida of Tohoku University defined “nature technology” as technology for the creation of a spiritually rich life using the least energy and fewest materials. He gave as an example a small, efficient wind generator currently under development in Japan that is based on the wing of a dragonfly. The generator has a rotor with a diameter of only 200—500 millimeters, according to Ishida.

Koichi Nakamura of the Japan Soap & Detergent Association (JSDA) gave details of how the eco-consciousness of the Japanese has helped shape buying habits. For one, the market share of refill-able liquid detergents in Japan has reached about 80% in 10 years. (Consumers first buy a plastic container of detergent; refills are packaged in pouches.) For another, JSDA members have reduced the amount of plastic packaging by 15% from levels used in 1995. The issue of water use looms large in any discussion of sustainability in fabric and home care. (P&G’s McDonald noted, “There are some places where water is more expensive than detergent.”)

Life cycle analyses of laundry products clearly show that the majority of water use occurs in the user’s home and not in the manufacture of products. Unilever’s Randy Quinn, executive vice president of laundry, suggested that approximately 70% of the water used in laundering clothes by hand or machine is wasted in rinsing. Adding up the billions of washes in water-scarce countries (which soon will be virtually every country), and the rinse

cycle becomes something that is important for the industry to address.

Quinn laid out the inescapable equation: Consumers equate the amount of foaming action with the cleaning power of a detergent. But foam requires extra rinsing to remove and therefore wastes water. (Consumers also still believe that bigger packs sold at the same price as concentrated versions give better value, which slows adoption of compacts.)

“We need to be bolder,” he said, “and formulate for superior cleaning without foam for [laundry] without rinsing. But is this a step too far for industry?”

Regardless of whether the industry takes that step in the future, Quinn called upon his colleagues to roll out concentrates now “faster and better, in collaboration if possible.”

## CHINA AND THE RISE OF THE REST

The optimistic tone of the conference was due in part to the growth prospects for fabric and home care in emerging markets.

For example, India currently spends only \$3 per capita on household cleaning products, whereas China spends only \$6. Compare those figures to the US and Western European average of \$60 and the cause for optimism is clear. As Deutsche Bank’s Bill Schmitz noted the Chinese detergent category would grow from \$5 billion to \$22 billion if Chinese consumption were equal to that of Russia’s.

“When we think of China, we tend to forget about innovation and creativity,” said Max von Zedwitz, a professor at Tongji University in China, who advised participants not to underestimate the intellectual sophistication of that country. “I would not be surprised if the first person to set foot on Mars is Chinese,” he added.

Chinese expenditures on research and development (R&D) have grown at eight times the pace of US expenditures; Chinese R&D spending likely will reach 2.5% of GDP (Gross Domestic Product) by 2020. In 2008, Guangdong province alone filed more patent applications (103,883) than Ja-

pan (38,408), the United States (27,656), and Germany (10,145).

The numbers are staggering: More than 10 million students take the college entrance exams every year, von Zedtwitz said, and between five and six million freshmen enter college each year. Furthermore, more than 50% major in engineering, science, or medicine.

“Send your most challenging R&D problems to China,” von Zedtwitz urged. Many companies already have; more than 1,200 foreign-owned R&D centers had been set up in China by 2009, he noted.

Here are more statistics from Chor Pharn Lee and the Futures Group in Singapore: The global middle class will increase from 430 million in 2000 to 1.15 billion in 2030. In 10 years, the No. 1 English-speaking country in the world will be China. By 2025, five of the top 10 most populous cities will be in South Asia (Karachi, Pakistan; Dhaka, Bangladesh; and Delhi, Calcutta, and Mumbai in India). In 2030, 221 Chinese cities will have populations of more than one million; Europe has 35 today and the United States has nine.

But the story does not begin and end in Asia, the Futures Group notes. The Persian Gulf states are reinventing their petrochemical industries and will earn \$9 trillion in the next 14 years from petroleum.

Many questions remain. China’s working population is expected to peak in 2015. Will China get old before it gets rich? India’s working population likely will peak in 2035. Will India become the new contender? Perhaps the answers to these questions will be clearer by the time the industry meets again in Montreux in 2014.

The far-ranging program, which also covered smarter ways of conducting R&D and neuromarketing, was organized by an executive committee comprising J. Keith Grime, president, JKG Consulting, LLC, USA; and co-chairs Thomas H. Mueller-Kirschbaum, corporate senior vice president, Henkel AG & Co. KGaA, Germany; and Manfred Trautmann, vice president and general manager, BU Detergents & Intermediates, Clariant International, Switzerland.

Co-sponsors of the meeting included the American Cleaning Institute; the International Association for Soaps, Detergents, and Maintenance Products (AISE); the Comite Europeen des Agents de Surface et leurs Intermediates Organiques (CESIO); the Japan Oil Chemists’ Society; and the Japan Soap and Detergent Association. Participating organizations include the China Association of Surfactant Soap & Detergent Industries, the Italian Chemical Society, the Oil Technologists’ Association of India, the Swiss Cosmetic and Detergent Association, and the UK Cleaning Products Industry Association.

Catherine Watkins is associate editor of *inform* and can be reached at [cwatkins@aocs.org](mailto:cwatkins@aocs.org).

*(Courtesy : inform, December 2010, Vol. 21 (11))*

## “WONDER STORY”

**International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment**

**Mark Messina and Virginia Messina**

COMMERCIAL soybean production in the United States began in the 1930s. Today, the United States grows more soybeans than any other country and is responsible for nearly one-third of the world’s more than 200 million metric tons produced annually. The United States also leads the way in developing innovative soy products for human consumption and in investigating health effects of these new products, as well as those of the more traditional soyfoods such as miso, tempe, soymilk, and tofu. Nearly 2,000 peer-reviewed papers from research related to soy and health are published annually.

For four days this past October in Washington, DC, the latest of this research was presented and discussed by scientists from around the globe at the 9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment. Presentations addressed emerging research areas as well as issues that are vigorously debated within the re-

search community. These included the cholesterol-lowering effects of soy protein and the use of soyfoods by women with breast cancer. A session was also devoted to findings regarding equol, a compound that is not found in soybeans but is produced by intestinal bacteria from the soy isoflavone daidzein.

Highlights from the symposium are presented below. A more in-depth report will appear in the *Journal of Nutrition*.

## **SOY AND BREAST CANCER**

The influence of soy intake on breast cancer prognosis continues to be a contentious issue because of its potential public health impact. Several presenters at the symposium directly addressed this issue. Gertraud Maskarinec from the Cancer Research Center of Hawaii (Honolulu, USA) and Seema A. Khan, Northwestern University Feinberg School of Medicine (Chicago, Illinois, USA), discussed recently conducted clinical studies; Xiao Ou Shu, Vanderbilt University (Nashville, Tennessee, USA) and Xinmei Kang, from the Cancer Hospital of Harbin Medical University (Heilongjiang, China), presented findings from epidemiologic research.

The clinical studies addressed markers of breast cancer risk. Maskarinec examined the effects of soyfood intake (~2 servings/d) on nipple aspirate fluid volume in a 12-mo crossover study (6 mo per phase) that included 96 healthy premenopausal women, and Khan looked at breast cell proliferation in high-risk pre- and postmenopausal women aged 25 to 55 y by examining cells obtained by fine needle aspiration, before and after 6 mo of isoflavone supplementation (100 mg/d). These markers were not affected in either study, which suggests that soy was not associated with breast cancer risk.

In the epidemiologic studies, soy intake was associated with improved prognosis among women with breast cancer. Shu reported that recurrence and mortality were reduced by about 30% among Shanghai breast cancer patients who consumed the equivalent of at least 2 servings/d of soy. Protective effects were noted in both pre- and postmenopausal patients and in patients with both estrogen-sensitive and hormone-independent tu-

mors. There was also a 30% reduction in tumor recurrence in the study by Kang, which took place in Harbin (China); however, benefits were limited to postmenopausal women with estrogen-sensitive tumors and there was no effect on mortality.

The results of these two Chinese studies are impressive, but the findings are from a population of women who are likely to have consumed soyfoods for all or most of their lives. Before Western oncologists can recommend soyfoods for the specific purpose of improving prognosis, it will be necessary to demonstrate that they apply to non-Chinese women who have not consumed soy prior to their diagnosis.

## **CHOLESTEROL REDUCTION**

In 1999 the US Food and Drug Administration (FDA) approved a health claim for soyfoods and coronary heart disease, which was endorsed a year later by the American Heart Association (AHA). However, over the past 5 years, the cholesterol-lowering effects of soy protein have been challenged, most notably by the AHA. In their most recent position paper published in 2006, the AHA in essence withdrew its support of the health claim. Although they acknowledged the role soyfoods can play in heart-healthy diets because of their fatty acid profile, the AHA concluded, on the basis of 22 studies, that soy protein lowered LDL (low-density lipoprotein)-cholesterol by only 3%. However, the AHA's review of studies did not include a comprehensive statistical analysis. Based on a meta-analysis presented at the symposium, David Jenkins of the University of Toronto (Ontario, Canada) found that soy protein lowered LDL-cholesterol by almost 50% more than the AHA's estimate for a total average reduction of 4.3%. Furthermore, when the analysis was limited to the 11 studies in which the soy and control diets were evenly matched, LDL-cholesterol was reduced by 5.2%. James W. Anderson, University of Kentucky (Lexington, USA), presented similar findings on the basis of a meta-analysis of 20 parallel trials published since 1995.

The FDA is currently evaluating the evidence related to the soy protein health claim, and the results of these two meta-analyses suggest that their 1999 decision will be affirmed. In contrast, the European Food Safety Authority (EFSA) re-

cently rejected a petition for a soy protein health claim similar to the one approved by the FDA. However, as explained by Janice Harland, HarlandHull (Gloucester, United Kingdom), EFSA considered only four of the 23 studies included in the petition. These were studies that used isolated soy protein (ISP) from which the isoflavones were extracted (ISP-) as the intervention product. This restriction was adopted in order to determine whether soy protein specifically was responsible for cholesterol reduction. However, since isoflavones are naturally associated (via hydrogen bonding) with the protein in soybeans and ISP- is produced for experimental purposes only, this approach has limited practical implications. The issue is currently under discussion between European authorities, EFSA, and those who submitted the petition.

Finally, Arash Mirrahimi, Claire E. Berryman, and Li Wang, from The Pennsylvania State University (University Park, USA), provided estimates of the extent to which substituting soyfoods for commonly consumed protein sources in the US diet may lower blood cholesterol as a result of differences in fatty acid intake. Using NHANES (National Health and Nutrition Examination Survey) III population data, they estimated LDL-cholesterol levels were lowered by 4.3% when 24 g soy protein (essentially the amount of soy protein established by the FDA for cholesterol reduction) from soyfoods replaced 24 g protein from animal products. Taken together, these findings suggest that soyfoods can lower LDL-cholesterol by approximately 9%, which in turn will theoretically lower the incidence of heart disease by 9 to 18%.

## **EQUOL**

Equol is a bacterially derived product of the soybean isoflavone daid-zein that is believed to have potential health benefits. Only approximately 25% of Westerners host the gut bacteria capable of converting daidzein to equol. Presentations at the symposium greatly expanded knowledge of the safety and efficacy of this compound. For example, Belinda Jenks, Pharmavite, LLC (Northridge, California, USA), discussed a wide array of safety studies that have been conducted using SE5-OH, an equol-rich product produced via fermentation of soy hypocotyledon. There now exists a Generally Recognized As Safe (GRAS)

Self Determination Dossier for SE5-OH.

In regard to efficacy, Takeshi Aso, Tokyo Medical and Dental University (Japan), described the results of three Japanese studies showing that equol alleviates hot flashes. Evidence was also presented suggesting that equol may exert/skeletal benefits (Yuko Tousei, from the Japanese National Institute of Health and Nutrition) and promote cardiovascular health (Takeshi Usui, Clinical Research Institute, National Hospital Organization Kyoto Medical Center).

## **EMERGING RESEARCH AREAS**

In some cases, research presented in Washington provided the most definitive data to date in support of long-existing hypotheses. For example, Mindy Kurzer, University of Minnesota (Minneapolis-St. Paul, USA), presented the results of a systematic review and meta-analysis, which included 17 studies, that showed isoflavone supplements reduced both the frequency and severity of hot flashes. However, there were also several presentations that addressed emerging areas of research regarding soy and health.

For example, Robin van den Berg, Unilever, presented the results of a 14-wk clinical study that showed an isoflavone-containing beverage reduced facial wrinkles and increased collagen synthesis in postmenopausal women. Animal data presented by Thomas Badger, Arkansas Children's Hospital (Little Rock, United States), suggested that soy may have a role in helping to prevent nonalcoholic fatty liver disease, an emerging public health concern as rates of obesity increase among children and adults. Finally, Grzegorz Wegrzyn, University of Gdansk (Poland), described clinical work indicating that the soybean isoflavone genistein could play a role in treatment of children with mucopolysaccharidoses, an inherited metabolic disorder caused by genetic mutations leading to dysfunction of one of the enzymes involved in the degradation of glycosamino-glycans in lysosomes.

## **CONCLUSIONS**

The diversity of presentations at the ninth international soy symposium is a testament to the continued interest in understanding the health effects

of soyfoods and soybean components. Not all research areas will ultimately prove fruitful, but the symposium in Washington certainly supports the role that soyfoods can have in improving standard Western diets.

(Courtesy : *inform*, December 2010,  
Vol. 21 (11))

## “FRIENDLY”

### FORMULATION OF ECO-FRIENDLY SOAPS AND DETERGENTS FROM BIODIESEL PROCESSING

**Ashishkumar A. Kanoje &  
Avinash M. Balbudhe**

*Department of Chemical Technology,  
Laxminarayan Institute of Technology, Nagpur*

#### ABSTRACT

WITH the boom in population and industrialization their exerts a great pressure on petrochemical industries to produce large number of fuel to satisfy the social need. In this context, production of biodiesel from edible and non-edible oil sources has been identified as a major remedy for diesel production. Biodiesel can be simply produced by the process of transesterification of vegetable oil with excess methanol in the presence of suitable catalyst like sodium methoxide. During this processing of biodiesel a stage comes in which boiling water or hot water is added to the crude biodiesel for the purification. Attempt should be taken to treat this waste water coming after the purification of crude biodiesel. Because after every purification, waste water should be removed this contains glycerol and untreated methanol which are useful byproduct. The byproduct glycerol is fed for the further purification and then pure glycerol can be utilized in the manufacture of soap and detergents. Soap is the sodium salt of fatty acid and detergents can also be made from this wastewater obtained during biodiesel processing. This leads to the conversion of waste effluent to value added products.

For every 100 liters of biodiesel that we will make contains about 20-25 liters of glycerol and this glycerol contains 25% of methanol. This should be

considered as hazardous waste. As per an environment problem, we cannot throw this glycerol as a waste. Hence, it is beneficial to use this waste effluent for the production of soaps and detergents and it is called as eco-friendly soaps and detergents made by biodiesel processing. This glycerol can also be used for the manufacture of epichlorohydrin & propylene glycol.

Keywords : Biodiesel, wastewater, soap & detergents.

(Courtesy : Seminar on “Recent Trends in Oils and Oleochemicals, Western Zone OTAI, Nagpur).

## “GREAT FUTURE”

### BIODIESEL: FUEL FOR FUTURE

**Deepak Yadav, Suraj Ahuja**

*Chemical Technology, LIT-NAGPUR*

#### ABSTRACT

THE world is confronted with twin crises of fossil fuel depletion and environmental degradation. The continuous increasing demand for energy and diminishing tendency of petroleum resources has led to search for alternative clean renewable domestic fuel. Biodiesel refers to a vegetable oil or animal based fuel, consisting of long chain alkyl esters.

Biodiesel is produced from vegetable oil by processing like blending, microemulsification, pyrolysis and transesterification. Among which the transesterification is attractive and widely accepted technique. The purpose of transesterification is to lower the viscosity of oil.

Biodiesel seems to be real fuel for the future, it has become more attractive recently because of the environmental benefits like it is renewable, biodegradable, non-toxic and essentially free from sulphur and aromatic content. It does not contribute to rise of the level of carbon dioxide and consequently to the greenhouse effect.

India is expected to be the world's fourth largest consumer of energy by 2020, and will rely on

heavily on crude imports to satisfy the demand for oil. Biodiesel play an important role in reducing crude import by 18 percent.

#### Keywords:

1. Fossil fuel
2. Transesterification
3. Environmental benefits
4. Crude imports

#### Conclusions:

For making this future fuel realistic all we have to do is keep maximum target of non edible seeds in degraded or fellow land to make the availability of raw material in bulk for commercial production.

#### References:

1. Biodiesel - Handling and use guidelines, Third edition 2006, US Department of Energy.
2. "Progress and recent trends in biofuels", Progress in Energy and Combustion Science 33 (2001 pp. 1-18,

*(Courtesy : Seminar on "Recent Trends in Oils and Oleochemicals, Western Zone OTAI, Nagpur).*

## WASTE TO WEALTH

### BIO-SURFACTANTS FROM KARANJA BIODIESEL WASTE

**C. S. Madankar<sup>a</sup>, Subalaxmi Pradhan<sup>a</sup>, Lalit Prasad<sup>b</sup>, S. N. Naik<sup>a\*</sup>**

<sup>a</sup>Centre for Rural Development and Technology,

<sup>b</sup>Centre for Energy Studies,  
Indian Institute of Technology, Delhi,  
Hauz Khas, New Delhi-110016, India

#### ABSTRACT

MOST of the Surfactants are produced from LABS (Linear Alkyl Benzene Sulphonate). It is having

petrochemical origin, thus it is non-biodegradable and causes harm to the environment. With taking care of environmental factors today's need is the use of renewable resource like oils, fats and biodiesel waste for surfactants production. Bio-surfactants are obtain from renewable resources and are preferred because of their renewability and ecofriendly nature. Most of the bio surfactants are obtained from oils and fats or their derivatives. Karanja bio-diesel waste mainly contains crude glycerol and some amount of soap, monoglyceride, diglycerides, oil, methyl alcohol, water and traces of unsaponifiable matter. Crude glycerol can be purified and used for the manufacture of the monoglycerides, diglycerides and other esters. These are mainly used as emulsifier, wetting agents, pesticides, fungicides and acticides etc.

In India Bio-fuel programme was introduced in 2003, Karanja and Jatropa oil have been identified as potential crop used for the production of bio-diesel which will go up to 13 million tones by 2012, thus the biodiesel waste which is mainly crude glycerol will be produced in huge quantity, nearly 1.3 million tones and it was mandatory to blend 5% of biodiesel in petrol and diesel. The requirements of the surfactants are increasing in all sectors with the rising socio-economic standard of the countries. Hence the production of the petrochemical-based surfactants is increasing continuously as the technologies are already available. However, with respect to the rising concern for the environment and health issues, the synthesis of surfactants derived from renewable resources is timely and important.

#### Keywords:

Karanja; Biodiesel;  
Glycerol;  
Transesterification;  
Biodiesel waste.

*(Courtesy : Seminar on "Recent Trends in Oils and Oleochemicals, Western Zone OTAI, Nagpur).*



## “MORE THAN A SOAP”

### MUSHROOMS - A SOURCE OF COSMETIC MAGIC

*THE mushrooms apart from being a delicacy to serve at the dinner table has many unusual pharmaceutical and cosmetic properties. Dr Allan Onions of Honeywill & Stein reveals some well-kept secrets of the fabulous fungi.*

Apart from being served in restaurants, sauted in garlic butter most people know little about mushrooms. The exception perhaps being the minority who have a fringe interest in those varieties with hallucinogenic properties - the “magic mushrooms” of the 1960’s generation.

There are over 1,500 varieties of fungi growing in the UK today. These range from edible field mushroom (*Agaricus campestris*), the hallucinogenic Fly Agaric (*Amanita muscaria*) and Liberty Cap (*Psilocybe neolanceolata*) a resident of Hampstead Heath, to the deadly poisonous Destroying Angel (*Amanita virasa*) and the aptly named Death Cap (*Amanita phalloides*).

Worldwide, over 64,000 have been identified. Fungi are unique amongst the plant kingdom, in that they possess no chlorophyll. Thus they cannot take part in photosynthesis for their metabolism and have to resort to other means in order to live.

Many enjoy symbolic or parasitic relationships with other plants whilst others are free growing, generally on decaying matter, from which they derive their nutrients. As they contain no chlorophyll, they do not take in CO<sub>2</sub> and give off O<sub>2</sub>, as do green plants, but respire in the opposite way, similar to animals, as net consumers of oxygen.

#### HISTORICAL PERSPECTIVES

As with most plants, different peoples from around the Globe have over the ages investigated not only the culinary attributes of fungi, but also their medicinal and cosmetics properties.

There is some debate as to when we first started eating mushrooms, no one seems to know for sure. Indications are that nomadic hunters as long ago as the last Ice age feasted on various local fungi but it was during classic times that mush-

rooms came to the fore and their use was initially recorded.

In the first century, the physician Nicander eloquently spelled out the dangers of eating the wrong varieties, Dioscorides making similar reference some hundred years later, Greeks and Romans were partial to mushrooms, and at least one Roman Emperor, the infamous Gladius, succumbed to the toxins of *Amanita caesarea*, albeit with the helping hands of his scheming wife Agrippia and a local witch Locuste. However, the beneficial medicinal properties of mushroom were also recognised and recorded by Dioscorides who described *Agaricus*, actually a *Fomes* spp, as being effective against colds, sores, fractures, asthma etc.

In more modern times, the first serious attempt to classify mushrooms was made by French botanist Clusius. The famous herbals written by Gerard and Cupeper hardly give mushrooms a mention.



*Kawaratake, is known in the UK as the turkey-tail mushroom. In Japan, it is drunk in the form of a tea for the treatment of flu, colds, asthma, bronchitis and is much sought after as a tonic for general debility. It is also used in many food delicacies. Cosmetically, Kawaratake is used in the Far East for treating areas with weak connective tissue, in massage formulations, the treatment of acne and on irritated erythema due to the effects of excess UV rays. Suggested cosmetics applications include after-sun, anti-acne products, and massage formulations and anti-cellulite products.*



***Matsutake (Tricholoma matsutake) is the Korean Pine Mushroom, known locally in Korea as Song-Yi. It is recommended for the corporation in sensitive facial lotions, moisturising products, sensitive skin products, haircare, bath and shower products where the stimulating effects of the pine fragrance can be utilised.***

Grieve, on the other hand, in 'A Moden Herbal' (1), gives fungi a good airing, referring to medicinal and even pharmaceutical status for several species including the Giant Puff Bali (*Lycoperdon gigantea*) which apart from forming part of the diet for some native American tribes has been used in the UK to arrest haemorrhage.

The hallucinogenic properties of mushrooms have been associated with Shamanism in many parts of the world. Nomadic hunters of Northern Europe and Asia have been reported as using Fly Agaric (*amanita muscaria*) to induce shamanistic trances.



***Known as the Deer Mushroom in the USA, Cordyceps sabolitera, is known in Japan as Semitake. It is traditionally used in Japan as a food and medicinal mushroom, used for the treatment of general debility, post-partum debility and as a natural antibiotic.***



***Reishi mushroom is recommended for use in sensitive facial lotions, moisturisers and sensitive skin products. The Reishi mushroom itself has enjoyed an elevated position in the Far East, where it is considered a Taoist elixir of life (the mushroom of deathlessness) and once reserved for the Emperor, it has a long association with longevity and increased spiritual energy.***

The Koryak people of Eastern Sibena believed spirits known to them, as Wapag man inhabited the plants. These spirits of the woods were believed to have left the fungi for the benefit of mankind to enable them to learn something of temporal world.

One well reported story relates to times of short supply of the fungus and to a strange kind of pecking order in which the most senior shaman takes the potion into his trance and then urinates into a cup which is then drunk by the next senior shaman. Apparently, the hallucinogen, is quickly absorbed into the urine via the kidneys. It continues to be passed around in the group in this fashion.

In Central and South America also, this local magic mushroom is utilised for shamanistic purposes. Elderly women of the tribes employ *Psilocybe mexicana*, a relative of the afore mentioned Hampstead Health variety, to aid in the prescription of magic and cures. The *Psilocybe* species contain two psilocin. Although chemically related to LSD they possess only approximately 1 % of its psychotropic activity (2).

Nearer to home, it is believed that witches of the Middle Ages were well aware of the psychotropic effects of certain mushrooms. It is believed the act of riding on broomsticks is actually a representation of their use of sticks to administer mushroom

potions and already, a well documented route for drugs to enter the bloodstream quickly.

But as with many things botanical, it is the inhabitants of the Pacific Rim that seem to have studied more deeply the beneficial properties of mushrooms.

Perhaps the best known Japanese mushroom is the Shiitake (*Lentinus edodes*). It is cultivated on oak logs with which it enjoys a parasitic relationship. In the Far East it is revered. Foodwise, it is stir fried, cooked in soups, canned or pickled. It is nutritious and rich in essential amino acids.

In both China and Japan, it is considered a revitalising tonic whilst some consider it to enhance sexual performance. It is prescribed to reduce blood pressure and cholesterol, to treat anaemia, diabetes and cancer possibly via a stimulation of the immune system. The chemical lentinan resists carcinogen, an attribute shared by many fungal carbohydrates.

## ENERGISING PROPERTIES

In the Far East a holistic approach prevails for both health and beauty and a Shiitake mushroom tea is one means used to strengthen, vitalise, energise and tone the body. (3)

*Coriolus versicolor*, Kawaratake, is known in the UK as the turkey-tail mushroom. In Japan, it is drunk in the form of a tea for the treatment of flu, colds, asthma, bronchitis and is much sought after as a tonic for general debility. It is also used in many food delicacies.

Chemical analysis shows it to be rich in coriolin which has been known to exhibit anti-biotic and tumor inhibitory actions and a protein bound polysaccharide, klein, which has been shown to have a cytotoxic effect on skin and other cancer cells.

Cosmetically, Kawaratake is used in the Far East for treating areas with weak connective tissue, in massage formulations, the treatment of acne and on irritated erythema due to the effects of excess UV rays. Suggested cosmetics applications include after-sun, anti-acne products, and massage formula-



*Mannentake (Ganoderma lucidum) is mainly a food source mushroom which for medicinal applications are as a tonic for general debility and as a natural antibiotic. The rich mushroom oil, extracted from the waxes affords a fatty oil which is used sparingly in seasoning foods. Medicinally, it is used to treat and remove warts, swellings and to smooth the coarse and chapped skin.*

tions and anti-cellulite products.

Matsutake (*Tricholoma matsutake*) is the Korean Pine Mushroom, known locally in Korea as Song-Yi. This edible fungus is much sought after in Japan due to its unique fragrance, a sweet pine like odour with earthy mushroom undertones. As such it provides a natural flavouring and fragrance to festive season delicacies where it is used as the main ingredient. It grows in a symbiotic relationship with pine trees.

Chemically, the pine-like fragrance is provided by concentrations of alpha and beta-pinene, cembrene and S-matsutake alcohol. It has also been shown to contain amino acids and methyl cis-a-methyl cinnamate which aid moisture retention and 2-octen-1-ol which stimulates peripheral circulation.

Cosmetically, it has traditionally been used as a decoction, normally steeped overnight in water, the solution then being used as a facial wash, generally in Autumn, to remove Summer sun darkened facial spots and for the tightening of facial wrinkles in a new development, which mirrors this traditional use, an alcoholic extract, rich in spngyic acid, is generating great interest in Korea as a skin whitening agent as an alternative to kojic acid.

Matsutake is recommended for the incorporation in sensitive facial lotions, moisturising products, sensitive skin products, haircare, bath and shower products where the stimulating effects of the pine fragrance can be utilised.

Ralgankin (*Polyporus mylittoe*) has been shown to contain an interesting variety of chemicals that make it an ideal candidate for haircare products.

A study of its ethnobotany shows that in addition to culinary applications, it has been used for haircare preparations and the treatment of dandruff.

This can be rationalised by investigation of its chemical constituents which include bio-sulphur and salicylic acid, the first is an effective anti-mycotic whilst the salicylic acid exhibits keralytic effects.

Also present are volatile oils which act as a stimulant for the scalp and organic acids which are astringent.

Mirroring the traditional use and making use of the identified active ingredients, Raigankin may be recommended for incorporation into all hair care products, particularly those designed for the treatment of dandruff.

## **EASTERN TONIC**

Known as the Deer Mushroom in the USA, *Cordyceps sabolitera*, is known in Japan as Semitake. It is traditionally used in Japan as a food and medicinal mushroom, used for the treatment of general debility, post-partum debility and as a natural antibiotic. As a food, it is incorporated into a rich spicy mushroom cream stock for soups and broths and also as a mushroom spice. It exhibits a faint spicy cinnamon fragrance.

Chemical analysis reveals amino acids which regulate moisture on the surface of the skin, ophiocordin, which show bacteriostatic and anti-phlogistic properties, and polysaccharide co-1 which stimulates peripheral blood flow.

These properties suggest application in cooling preparations, refreshing facial lotions, moisturising preparations and after-bath skincare products.

Magojakushi (*Ganoderma neo-japonicum*) is a much sought after delicacy and is known as panaceapolyore. This mystical panacea is used in the highest class on tonics in the Far East and because of its scarcity is now often substituted by the more common Reishi mushroom (*Ganoderma lucidum*). It has been shown to contain a variety of ganodermapolyots which exhibit beneficial actions on the skin surface. It is recommended for use in sensitive facial lotions, moisturisers and sensitive skin products.

The Reishi mushroom itself has enjoyed an elevated position in the Far East, where it is considered a Taoist elixir of life (the mushroom of deathlessness) and once reserved for the Emperor, it has a long association with longevity and increased spiritual energy. It is said to boost the immune system and reduces free radicals associated with the ageing process by 50%.

Tsuriganedake (*Ferries fometorius*) is known as Amadou in the USA. In Japan it has been used as a dressing to staunch the flow of blood from deep wounds and in the form of a tea for the treatment of the flu, colds, asthma, bronchitis and general debility. It is used in many food delicacies, which are particularly consumed in the Autumn and Winter months. Traditional cosmetics use in the Far East is for treatment and repair of signs of skin ageing.

Analysis of the chemical constituents reveals moisturising polysaccharides, flavonoids that act as free radical scavengers and saponins that exhibit antiphlogistic action. Cyclic AMP is also present. This has been shown to be effective in the prevention of skin cell ageing. It has been reported as acting as a secondary messenger for the metabolic processes in inner cells which effectively prevents cellular changes and defers the early signs of ageing.

Tsuriganedake is recommended for use in after-sun preparations, facial lotions, haircare products, creams and lotions for rough and irritated skin and moisturising preparations.

The above products all utilise aqueous extracts, but many beneficial properties are associated with oil-soluble functional chemicals from the fungi, *Fornistopsis officinalis*, Eburiko, is a mushroom

used extensively as a foodstuff, a general tonic and a natural anti-oxidant and bactericide. The belt of waxes from around the mushroom margin is extracted to yield a rich mushroom oil which is used sparingly in the seasoning of foods.

### SKINCARE BENEFITS

The oil is used medicinally to treat slow healing wounds, for smoothing dry, coarse and chapped skin, as a novel source of g-linoleic acid, all transretinoic acid and fungal omega-3-polyunsaturated fatty acids and other polyunsaturated fungal lipids used for the repair of skin tissues and wound healing.....eczema, psoriasis and phlebitis.

The super critical CO<sub>2</sub> extracted oil is recommended for use in sensitive skin products, facial tonics and creams, hair shampoos, liquid soap preparations and rinse off skin and hair products.

Mannentake (*Ganoderma lucidum*) is mainly a food source mushroom which for medicinal applications are as a tonic for general debility and as a natural antibiotic. The rich mushroom oil, extracted from the waxes affords a fatty oil which is used sparingly in seasoning foods. Medicinally, it is used to treat and remove warts, swellings and to smooth the coarse and chapped skin. Identified constituents are ganodermenonol which exhibits anti-histamine action on the skin, vegetable sterols which exhibit circulation stimulating properties and unsaturated C14-C18 fatty acids which impart moisturising care.

Moisture regulating amino acids and octadecanoate which exhibits surface immune stimulation are also present. The caprylic / capric triglyceride extract of Mannentake may be useful in moisturising products, day and night creams and lotions, cleansing milks and liquid soap preparations.

A similar chemical mix may also be extracted from *Fornistopsis pinicola*, the redbelted polypore known in Japan as, Tsugasaromoshitake.

Additionally, it provides a source of an oil soluble red dye. Traditional cosmetics applications include the treatment of dry, coarse and chapped skin and as a natural red dye.

This has been just a brief look at a new, novel source of functional cosmetics ingredients. For a marketing view with a difference, sample the world of mushrooms to your new formulations.

### REFERENCES:

1. Grievog M, A Modern Herbal. Penguin Books. ISBN 0-14-046440-9.
2. Willis, SA, The Pharmaceutical Journal, 251,227-229, (1995).
3. Michellie D. Leigh, The Japanese Way of Beauty, Thorsohs, ISBN 0-7225-2976

*(Courtesy : Soaps, Detergents & Toilet Review, December 2010).*

## NATURAL & ORGANIC IS IN!

### HPCI CONGRESS MAKES A SUCCESSFUL ENTRY

HPCI (home and personal care ingredients) Congress made a successful entry in India this year bringing all the big brands from around the world under one roof. The mega event made its debut at the Grand Hyatt Mumbai on December 17-19. With the first edition making a remarkable success, the organisers have already planned the second edition to be bigger with added features.

The event aimed to serve players in the personal care and home care industries was organised in conjunction with the German chemist association SOFW and the Indian Society of Cosmetics Scientists (ISCC).

The conference and seminar ran parallel to the exhibition at the same venue for both days. Various international speakers gave presentations that focused on scientific innovations and developments in the areas of formulation and raw materials. Experts from leading universities and companies provided extensive insight into formulation techniques and new ingredients with special focus on natural and green products.

Around 1,400 visitors attended HPCI over the two-days period, visiting the exhibition and attending the conference and presentations.

The vibrant atmosphere at HPCI during long periods of the opening hours indicated the enthusiasm of the visitors to learning about and discuss the latest ingredients, their applications, formulations and services around homecare, cosmetics and personal care products.

HPCI event director Robert Fischer stated, "The HPCI Congress is a platform to bring peers together and to build business communication. The format of the congress reflects the need of the industry for a forum that combines education and business on reasonable economic conditions. The first edition has already been a success. Feedback from the exhibitors confirmed that they were 'very satisfied' with both the numbers and quality of visitors to their stands. Most of the 50-odd exhibitors have already re-confirmed their attendance for the next edition in 2012."

Interesting papers were presented on the natural concept expanding in India and natural and organics becoming a big market.

Dr R. Govindarajan, principal scientist, Himalaya Healthcare, presented the first paper on 'Naturals in personal care: Role of naturals in personal care formulations. Challenges to formulating with naturals.' He dealt on challenges faced while developing natural formulations and the need to consider excipients and preservatives. He stressed on working the ethical way while claiming your self going natural.

Krishan Gupta, MD and Global CEO, Organic India Ltd, delivered the Keynote address - An overview of Naturals: The global space versus the Indian opportunity. An overview of innovations, approaches and regulatory environment. Drivers shaping this evolving category.' His presentation included understanding the concept of natural and organic, Indian market and exports, Indian market- advantages and bottlenecks. The top 4 metros that contribute to over 80 per cent of the up-market products in the country included Chennai with accessible potential of 84 crore, Hyderabad at 33, Bangalore at 69, and Mumbai that topped the list with accessible potential of 148 crore.

On the exhibition side, the registered companies showcased their latest innovations in raw materials, machinery and services to formulators and

distributors.

Dow Chemicals, regional marketing manager, home and personal care, Farooq Alam, stated, "We have participated in SEPAWA Germany and now we are participating in HPCI India. We have met a lot of Indian formulators at the event and we find them very keen on knowing practical technology and not just theory. They see how the ingredient or the technology works, driven to making full formulation and checking out the demonstrated benefits in a practical and pragmatic way. We would appreciate if new novel technologies that are displayed at the booth are showcased and discussed at the technical seminars running parallel to the event."

Laurent Schubnel, operating marketing manager, Gattefosse, France, stated, "we have seen a change in the trend on customer demands in India over the years. Previously people would demand emulsifiers and products with powdery and dry finish, but now they are more keen on texture and feel of the product formulations. Now they look for active ingredients that help enhance the activity of their products."

France-based Gattefosse is involved in the development, manufacturing, and marketing of speciality ingredients and innovative formulation solutions for the health and beauty industries worldwide. The company had installed a Texture bar, where the visitors could test the formula and know the features of the product and decide what they want.

Schubnel also specified that Indian participants insisted on knowing the products, practically testing it, then knowing about them on paper, one main reason why they had got the texture bar installed. Many seemed to be crowding at Gattefosse with the attractive texture bar on display.

Inspired from Lijjat and Cosmetic valley in Germany, IWIN, Indian women Industries Network, also exhibited at HPCI Congress. IWIN is a private limited company, owned by 20 women entrepreneurs who have achieved success in cosmetic manufacturing, allied businesses all having experience in beauty and wellness domain. The company currently manufactures cosmetics for both Indian and international private labels, including retail chains, spas, salons. Sheela Iyer, associate director, IWIN,

stated, "We are presently setting up a new manufacturing facility with R&D lab, testing labs, packaging and training facilities, a whole 360 degree facility near Mumbai. Our company manufactures EU compliant line of products to comply with EU regulatory standards."

Fischer stated, "The trend these days observed around the world is that consumers have now shifted to natural products, so the formulators have also switched to natural products. Indians are also focusing on natural, ecological and biological ingredients. In India, besides going natural, the demand by consumers is on skin whitening products." Demand by producers is on good price, good quality, ingredients easy to formulate and demand for pre-formulated products that can mend according to the demand."

According to Rahul M Gavankar, sales manager, SOFW India, " Specific ingredients may be available only at specific places, the benefit of participating at HPQ is that, the participants get to learn about novel ingredients in the market and the ones coming newly in the market meets formulators and manufacturers from around the world, shares information about ingredients and markets, learning about the trends in the market and most vitally such international events act as a launch pad for new products."

The cosmetic and homecare market is rapidly growing in the India and wider SAARC region with double digit growth rates. This development is forecasted to last as these sophisticated markets use their unique location, culture and expertise to develop products for both domestic and international markets.

The next edition of HPQ Congress in India would be held on February 2-3, 2012, tentatively at the same venue and is expected to be bigger in size. According to Fischer, "Around 70 per cent of the floor space has already been booked by the major companies. The companies include Brenntag, Croda, Mascot, DSM, Dow Chemicals, Arihant. If the number increases way beyond, a bigger space would be arranged.

*(Courtesy : Ingredients south Asia, 1-15 January, 2011.)*

## "DON'T SPOIL SOIL"

**Vermipost : As soil amendment**

**DAYAMANI, K.J. UAS, GKVK**

TODAY most floriculture crops are produced in soil-less media that often contains an organic component. Certainly peat is one of the most widely employed organic materials contained in commercial soilless media. However, as peat supplies diminish because of over-harvesting, prices will inevitably rise. Therefore, identification of comparably priced substitutes for peat is imperative. One approach is to amend peat-based soilless media with other organic materials such as carbonized bark and compost. While these substances are not intended to substitute for peat, they do reduce the amount of peat used by 10 to 20%, while at the same time alter the physical and chemical properties of the media to provide optimal growing conditions.

At the same time there is growing environmental concern about the disposal of organic wastes such as sewage sludge, yard and garden waste, and animal manure. Therefore, bio-solid wastes must either be contained or converted to a non-hazardous form that will not pollute the environment. This, of course, has led to the skyrocketing of the cost of disposal. Composting such wastes is one environmentally sound way to convert biological waste into a form that can be easily disposed and provide a mechanism to recoup some of the costs incurred.

The primary reason for this is because the composting process is dependent on the aerobic action of soil microorganisms that break down the complex organic molecules to simple substances that can be taken up and utilized by plants. This bio-oxidative process is highly dependent on variable environmental conditions such as temperature and the availability of oxygen that are hard to control.

Another "composting" process that has not received as much attention is vermicomposting that relies on the action of earthworms to break down complex organic compounds. The worm castings

or fecal material produced by the worms is a rich source of a variety of essential plant nutrients. In contrast to conventional composts, vermicomposts are less variable and much more stable. In addition, the time to complete the composting process is much shorter for vermicomposts: one pound of worms can convert one pound of pig manure to compost in 48 hours.

Although much of the effect of vermicompost on plant growth can be attributed to the addition of important nutrients, there are other unknown factors involved. Plants grown in vermicompost-amended media still grow better than those grown in unamended media with similar nutritional levels. Furthermore, the promotive effect of vermicompost on growth is lost if it is sterilized and can not be restored by adding additional nutrients.

Regardless, the use of vermicompost in commercial soilless media holds great promise if the economics hold out. The widespread use of vermicompost as an amendment will ultimately depend on its cost of production. However, with the increased pressure to find alternate ways to safely dispose of animal manure, the techniques for vermicomposting on a large scale are now being developed that can economically process enormous amounts of animal waste.

*(Courtesy : Plant Horti Tech, Vol.10-No.4, Nov.-December, 2010).*

## “FEED THE BOVINE”

### Azolla - Good Feed For Livestock

**Dayamani K.J\*., Gangarathnamma, B.S\*\*.,  
Mukunda Lakshmi L\*\*\* and Jyothi\*\*\*\*,**

NOWADAYS a number of synthetic antibiotics, steroids and vitamins are used to increase the production of milk, meat, egg etc. These chemicals may accumulate in the human body, through the consumption of animal products and could cause various degenerative diseases. If we can substitute the cattle feeds with natural feeds that are rich in useful nutrients, it will be of great importance for human and animal health. Azolla can be used as a

good substitute for the cattle feed. Azolla is a fresh-water fern, which can be grown in artificial fresh-water tanks. It is associated with blue green alga that can fix nitrogen from the atmosphere. Because of this, it is also used a fertilizer in rice cultivation. This fern is a good source of minerals and nutrients; 60% of the dry matter is protein. It also contains vitamin A, antioxidants and other nutrients.

Azolla can be cheaply produced in good quantities and be used as a cheap and nutritious cattle feed. Azolla has been used as feed for pig, duck, and fish. It has high content of protein (20-30% on dry weight basis). Because its protein lacks in methionine and cysteine, combination with cereals is needed. Nutritional values of azolla to animals vary greatly on azolla species. *A. microphylla* is the best, and palatability by fish is better than other species. On dry weight basis, azolla can be mixed up to 10% of the purchased animal feed.

Technology Resource Centre of the Natural Resources Development Project (NARDEP) has developed a simple technology to grow azolla, which is useful for dairy farmers. It has been well established that azolla is an ideal feed substitute. Azolla has 50-60% protein on dry weight basis, rich in almost all essential amino acids, vitamin A, vitamin B-complex, beta-carotene and minerals viz. Calcium, phosphorus, potassium, iron, copper and magnesium.

- Rich in proteins, essential amino acids, vitamins (vitamin A, vitamin B12 and Beta-Carotene), growth promoter intermediaries and minerals like calcium, phosphorous, potassium, ferrous, copper, magnesium

- Dry weight basis, it contains 25 -35 percent protein, 10 - 15 percent minerals and 7-10 percent of amino acids, bio-active substances and biopolymers

- Livestock easily digest it, owing to its high pro-

---

\*Department of Agricultural Microbiology

\*\*Department of Sericulture,

\*\*\*Department of Horticulture,

\*\*\*\*Department of Agricultural Extension



tein and low lignin content

- Azolla can be mixed with concentrates or can be given directly to livestock

- Can also be fed to poultry, sheep, goats, pigs and rabbits.

- Milk production in animals can be increased by 10 to 20%

- It is a low cost feed for cattle, which helps to reduce the total feed cost.

### **Growing technology**

#### *Material required*

Silpauline sheets, sieved fertile soil, cowdung, powdered rock phosphate, culture of azolla and micronutrients.

### **Methodology**

In this method, an artificial pond made of silpauline sheets of 2.6m by 1.6m is used to grow azolla. About 10-15kg of sieved fertile soil is uniformly spread over the sheet. One kg of cowdung mixed in 10 litres of water is poured over it. Powdered rock phosphate should be added along with the cowdung slurry at a rate of 10-20g per pit. Water should be poured into the pond to a depth of 10cm. Then 0.5-1 kg of pure culture of azolla is inoculated in the pond. In about 10-15 days, azolla will fill up the pond, and daily 0.5-1 kg fresh azolla can

be harvested there after. About 1 Kg of super phosphate or rock phosphate and 500g of cow dung should be added once every five days to keep azolla in rapid multiplication phase and to maintain a production of one kg per pond every day. Micronutrient mixture should be added to the azolla pond at weekly intervals to enhance the mineral content of azolla.

### **Points to be remembered**

- Care should be taken to retain the temperature below 25°C.

- Shade nets can be used to cut the light intensity.

- The azolla biomass should be removed daily to avoid over crowding.

- The pH of the pond should be maintained between 5.5 and 7.0.

- After harvesting, the fresh azolla should be washed thoroughly to remove cow dung smell. Washing in a net will be useful as it will allow small plantlets to get out, and they can be poured back in to the pond.

- The cleaned azolla can be mixed with equal quantity of commercial feed and the mixture can be directly fed to dairy cattle and pig. Method and the materials required.

*(Courtesy : Plant Horti Tech, Vol.10-No.4, Nov.-December, 2010).*

# Biomass—The next revolution in surfactants?

Neil A. Burns

*There is constant debate about when and how quickly the world will run out of oil, but there is no doubt that, at some point, it will. The term “peak oil” has passed into the popular lexicon to describe the point at which oil production reaches its highest historical level, a point beyond which, literally and figuratively, it is downhill for oil producers. Figure 1 uses Energy Information Administration (EIA; an agency of the US Department of Energy) data to illustrate various predictions of when, and at what point, global oil and natural gas liquid production reaches its peak. You will quickly see from this figure that most predictions are grouped around now as the time that the peak is reached.*

THE issue of peak oil has implications, of course, for transportation and other essential areas such as heating. Not as widely discussed, at least in the mainstream media, are its implications for the chemical industry and surfactants in particular. Crude oil-based products end up as alcohol sulfates, ether sulfates, linear alkylbenzene sulfonates (LAB), alcohol ethoxylates, nonylphenol ethoxylates, softener, conditioner, antimicrobial quats, and amphoteric—that is, in essentially every major surfactant class used in every class of detergent, personal care, and industrial cleaning product. Try maintaining basic personal, household, and institutional hygiene for a day without oil.

If the prospect of an ultimately disappearing supply of oil does not keep you awake at night, then the recent trends in pricing and its volatility surely do, as illustrated in Figure 2. Since the early 1990s, oil prices have steadily marched up and the volatility has increased.

Since the oil embargoes of the early 1970s, the surfactant industry has looked to the oleochemical value chain as the counterbalance to a crude oil-based system. Since the early 1990s, the adoption of palm- and coconut-derived oleochemicals as “the answer” to a depleting and nonrenewable resource has accelerated. Although perfectly fine feedstocks, palm and coconut oils are not the answer. In recent years, as many supply chain professionals will attest, the vegetable oil market has started to behave increasingly like the crude market. Figure 3 bears an eerie resemblance to the

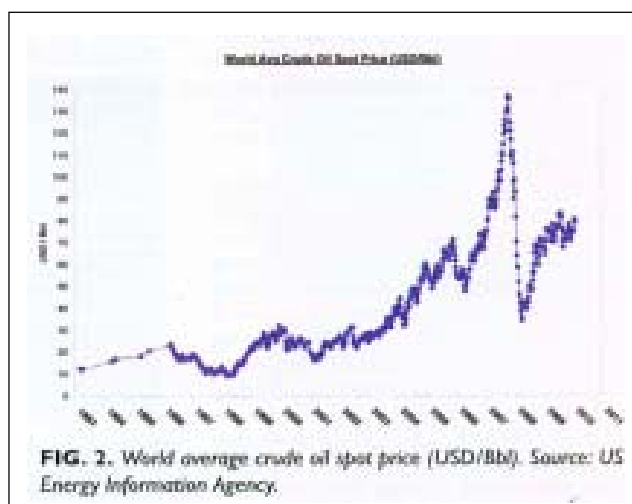
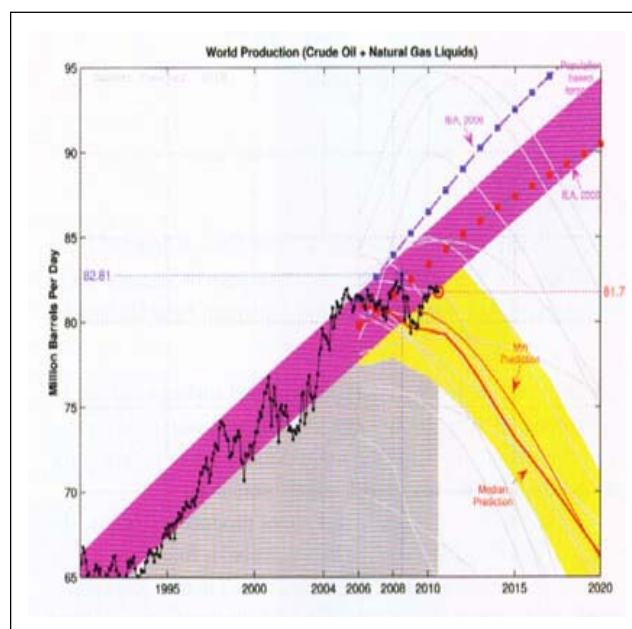
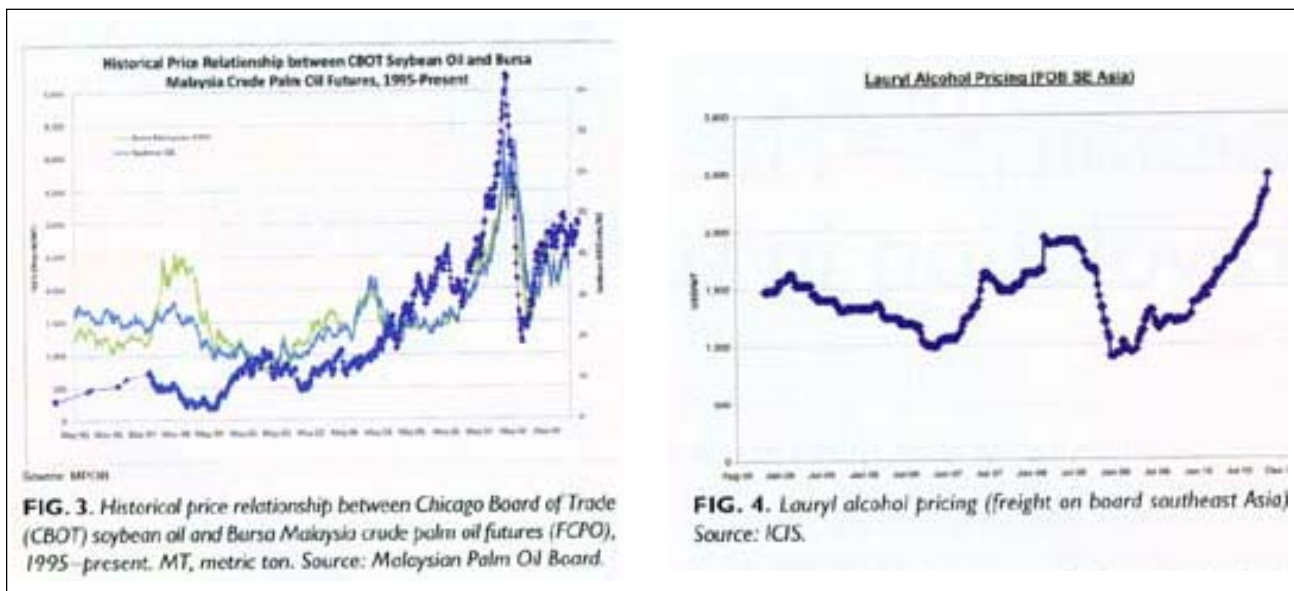


FIG. 2. World average crude oil spot price (USD/bbl). Source: US Energy Information Agency.



last 15 years of is clearly relevant. Products such as palm and soybean that can be used as food (as they have been for thousands of years) and fuel (as they have recently in biodiesel) are inevitably going to take some pricing cues from the major fuel, which is crude oil.

So where does this leave surfactant producers? Today, the pricing of key feedstocks such as lauryl alcohol is following, as one would expect, the vegetable oil markets, which in turn seem correlated with the crude oil markets. Figure 4 illustrates recent lauryl alcohol pricing trends. Petrochemical-derived alcohol is apparently offering little real alternative in current conditions, and the ability to substitute LAB for fatty alcohols has been tapped as far as it can go. So, this leaves surfactant producers looking for a viable alternative feedstock source that is renewable and less tightly correlated with the petrol and oleo oils now supporting the industry. This is where biomass and the recent technology developed around energy and, more recently, chemicals, comes in.

Biomass, by many definitions, is biological material derived from living or recently living organisms. Clearly this leaves out

coal and oil but includes palm oil and the other vegetable oils. For the purposes of this article we shall focus on emerging technology that is being used to convert traditional (e.g., palm, sugarcane) and new (e.g., algae) sources of biomass into chemicals, including surfactants.

In the last few years much time, energy, and money have been invested in trying to find a route from biomass to a gasoline substitute, given the overarching challenge posed by peak oil to the global economy. A number of companies have been formed for the original purpose of pursuing biofuel alternatives including Amyris, Gevo, Petroalgae, Codexis, Solazyme, Coskata, and Virent. Other

**TABLE I. Comparison of some sources of biodiesel**

Crop	Oil yield (L/ha)	Land area needed (M ha) <sup>a</sup>	% of existing US crop area <sup>a</sup>
Corn	172	1,540	846
Soybean	446	594	326
Canola	1,190	223	122
Jatropha	1,892	140	77
Coconut	2,689	99	54
Oil palm	5,950	45	24
Microalgae <sup>b</sup>	136,900	2	1.1
Microalgae <sup>c</sup>	58,700	4.5	2.5

<sup>a</sup>For meeting of all transport fuel needs of the United States. M ha, million hectares.

<sup>b</sup>70% oil by weight in biomass.

<sup>c</sup>30% oil by weight in biomass.

**TABLE 2.** Oil content of some microalgae

Microalga	Oil content (% dry weight)
<i>Botryococcus braunii</i>	25–75
<i>Chlorella</i> sp.	28–32
<i>Cryptocodinium cohnii</i>	20
<i>Cylindrotheca</i> sp.	16–37
<i>Dunaliella primolecta</i>	23
<i>Isochrysis</i> sp.	25–33
<i>Monallanthus salina</i>	>20
<i>Nannochloropsis</i> sp.	31–68
<i>Neochloris oleoabundans</i>	35–54
<i>Nitzschia</i> sp.	45–47
<i>Phaeodactylum tricornutum</i>	20–30
<i>Schizochytrium</i> sp.	50–77
<i>Tetraselmis sueica</i>	15–23

major companies, such as ExxonMobil, have established business initiatives around biofuel (in the case of ExxonMobil, most notably from algae). More recently, however, a number of biomass companies have realized that a quicker and more profitable route to market may initially be via chemicals and not biofuel.

The reasons for a “chemicals first” strategy include, firstly, that the cost barriers are not necessarily so onerous for the production of certain chemicals for application in, say, cosmetics as they are for mass-marketed gasoline. Chemicals markets are also more fragmented and niched than the transportation fuels markets. This makes it easier for a company to start small, commercialize, and earn money at a scale that is often still that of a demonstration plant for fuels production. For example, a 10 million lb (4.5 million kg)/yr chemical plant can produce a number of products and be commercially self sustainable. Even a 1 million lb/yr chemical plant is viable for the right product mix—this is the equivalent of about 140,000 gallons (530,000 liters) of fuel—hardly a meaningful amount of gasoline or any other transportation fuel.

Given the keen interest of surfactant producers in a good alternative to the oleo/petro duopoly—and the realization by the biofuel companies that

chemicals represent a shorter, quicker route to revenues and profits—we see the emergence of a very attractive area for both parties: biomass for the surfactant value chain.

This new potential third leg to the surfactant value-chain stool is much more than just conceptual at this stage. A number of companies have commercial or near-commercial activities focused in this area. A key question relating to any such serious initiative relates to the supply of sufficient quantities of biomass at the right price and in a timely manner. A biomass source that ends up being as tightly correlated in pricing to crude oil as vegetable oil has been is interesting, but not the sourcing revolution that the industry is looking for.

Algae represent just one such interesting source of biomass. It is an efficient crop, in terms of yield per acre, vs. others such as corn or sugar, and it does not have a competing food application (like both of the aforementioned alternatives). In an important paper published in *Biotechnology Advances* (25:294–306, 2007), Yusuf Chisti, a researcher at Massey University in New Zealand, outlines the case for microalgae as the only currently identified renewable source of biomass that potentially can be made available in sufficient quantity to represent a viable source of biomass for transportation fuel. This analysis provides, I believe, a logical underpinning for the use of algae-derived biomass as an alternative for the production of surfactant feedstocks.

Table 1, developed by Chisti, illustrates the efficiency of algae as a source of biomass for biodiesel production. It tabulates the acreage of commonly used crops that would be needed just to replace the current US consumption of gasoline with a biodiesel-based alternative.

Table 2 shows that the assumptions of either 30 or 70% oil content in microalgae species are not unreasonable.

The statistics in Tables 1 and 2, while meant to support the use of algae as a biodiesel source and thus a gasoline alternative, are also supportive of the broader concept of a crude oil and vegetable oil alternative in the surfactant value chain.

Commercial activity in the field of converting bio-

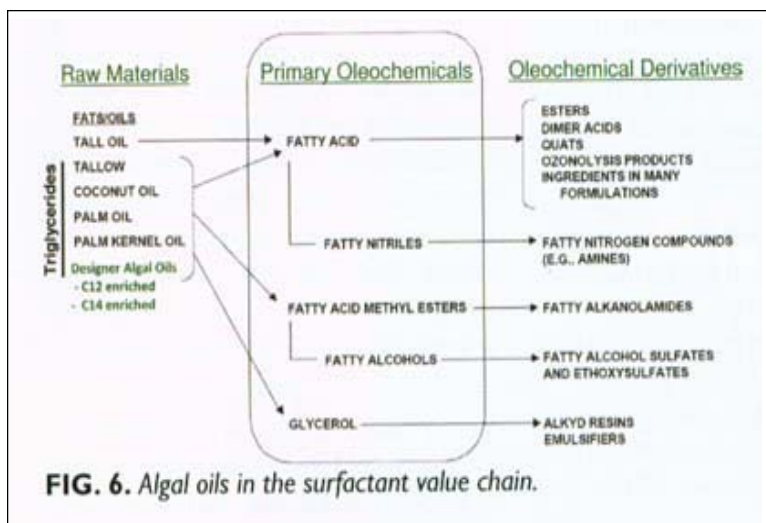


FIG. 6. Algal oils in the surfactant value chain.

mass to surfactants is well underway, and the biomass source is not confined to algae, as the following profiles show.

### SOLAZYME

Headquartered in South San Francisco, California, USA, Solazyme ([www.solazyme.com](http://www.solazyme.com)) was founded in 2003. A venture capital-funded company, it is well beyond the start-up stage. Solazyme's technology allows algae to produce oil and biomaterials. The company has partnered with Unilever in March 2010 to commercialize its technology in a range of consumer products.

### ELEVANCE

Headquartered in Bolingbrook, Illinois, USA, Elevance ([www.ele-vance.com](http://www.ele-vance.com)) uses metathesis technology to convert natural oils from a variety of sources (potentially including algal oil) to chemical feedstocks. Elevance recently formed a partnership with the sugar and palm plantation company, Wilmar, to build a biorefinery in Indonesia. The company also has a partnership with Stepan

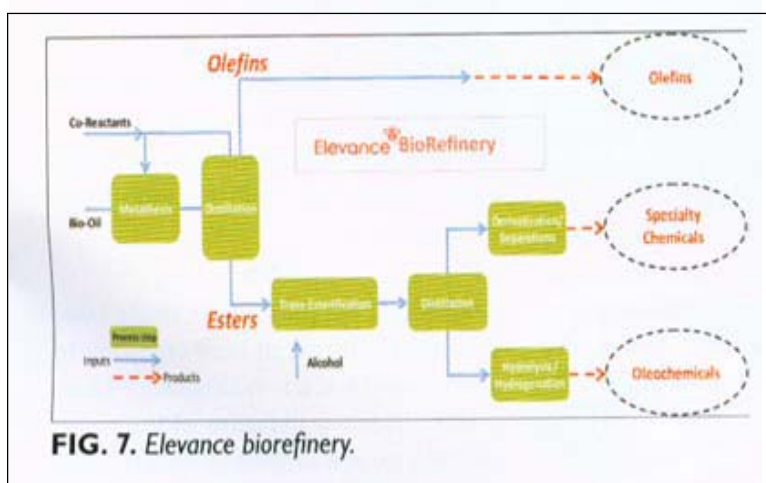
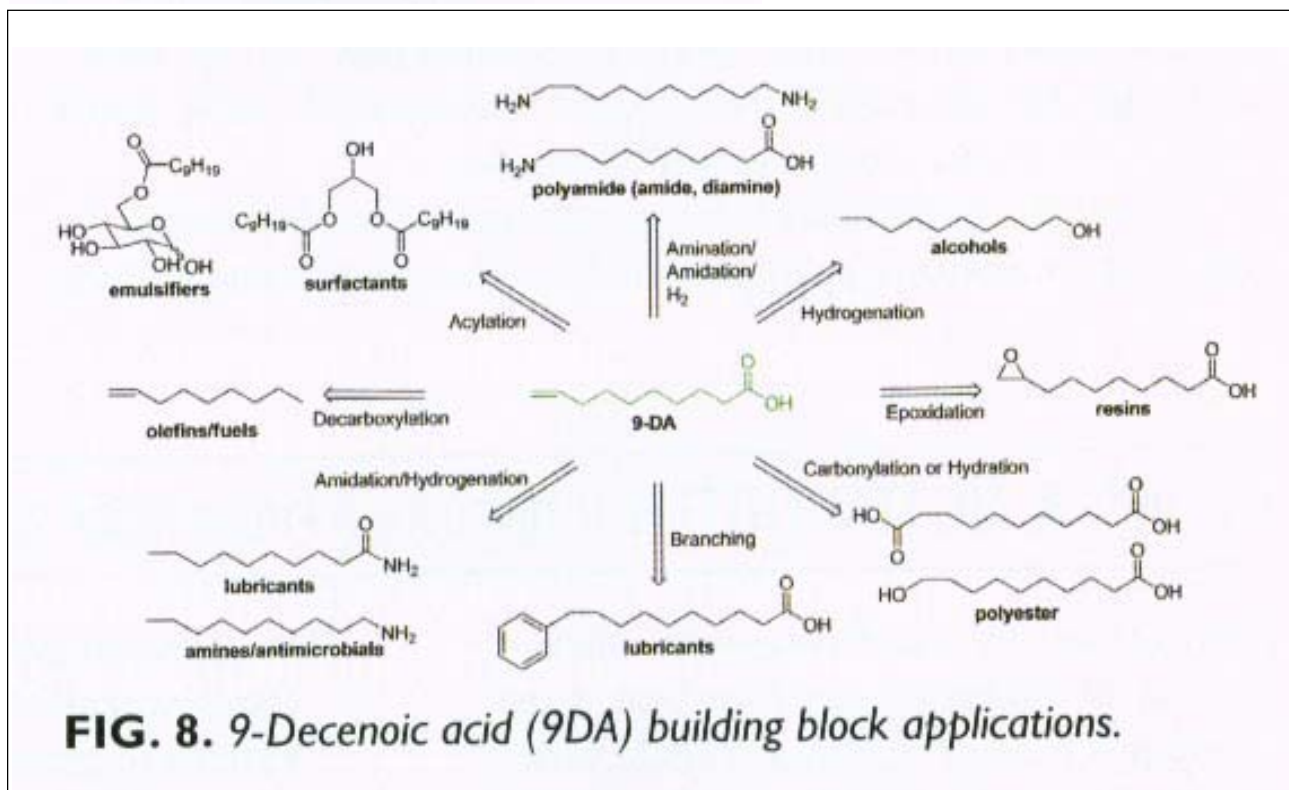


FIG. 7. Elevance biorefinery.



(North-field, Illinois) to commercialize its technology in Stepan's range of surfactants and polyols. Figure 7 illustrates the basic Elevance biorefinery technology.

Figure 8 illustrates the potential of just one of the building block chemicals produced by the Elevance technology and a subject of some of the joint development work with Stepan in surfactants.

## CONCLUSIONS

The field of biorenewables is fast moving, and chemical feedstock development is clearly a key objective of many of the formerly bio-fuels-only companies. As the need for additional options in surfactant feedstocks becomes more apparent, expect more companies to adapt their biomass technology to this area. Expect also further partnerships to be formed to accelerate commercialization. Such partnerships will go both downstream to consumer products (such as the Unilever/Solazyme arrangement) or upstream to the biomass sources themselves (as in Elevance /Wilmar).

*Neil Burns is the managing partner of Neil A Burns LLC, an investment and advisory firm. The firm invests equity capital in specialty chemicals companies with enterprise value between \$50 million and \$1.5 billion. The firm also provides advisory services in the field of surfactants, oleo-chemicals, and feedstocks. Burns serves on the board of directors of SiVance, a specialty silicones manufacturer and on the operating advisory boards of CenNx360 Capital Partners and Linley Capital Partners. Burns has over 20 years experience in specialty chemicals, including terms as CEO at Oxiteno USA, VP US Operations at VVF Ltd and a board director at Pilot Chemical Company. His education includes a BS in Chemistry from the University of York and an MBA from the Wharton School.*