



The Industrial Applications of BIOplastics 2002



This was the first conference to be sponsored by the new IENICA workstream. We were delighted that Novamont and the Iowa Department of Economic Development (USA) assisted with sponsorship. From the outset we wanted the conference to take an applied approach and make industry and commercial representation a priority; we decided to devote the first day to technical issues, and the second to commercial experiences developing bioplastics. We planned a large trade show with plenty of commercial products on display.

The conference attracted more than 100 delegates, 26 speakers and 11 trade stands – we were very pleased with this result. Clearly, bringing together a programme representing the European bioplastics industry and its latest developments is a major interest area.

The conference opened with a thought provoking presentation from A.T. Williams, from Air Terra Water Ltd., in the UK, who set the scene with a rather shocking description of the pollution created by conventional plastics in aquatic environments. I don't think anyone in the audience would dispute that the case for biodegradable plastics had been well and truly stated.

Novamont in Italy is a pioneer in the rapidly expanding bioplastics sector and has made significant investment in natural and renewable raw materials since 1989. Catia Bastioli described how Novamont have been trying to integrate environment, chemistry and agriculture for the development of tailor made materials with a superb discussion of Mater-Bi's starch-based technology. Remy Jongeboom of Rodenburg Polymers then presented data on Solanyl, a biopolymer produced by the fermentation of waste

from the Dutch potato industry. Rodenburg Polymers is in the very enviable position of having a free source of raw material for their polymers, which has clear environmental benefits, in terms of waste utilisation.

Erwin Vink of Cargill Dow LLC in the USA gave a fascinating presentation about NatureWorks™ polylactic acid (PLA), possibly the bioplastic to have received most publicity in recent years. The PLA story represents a \$500 million dollar investment and the commercialisation phase is now in progress. Cargill Dow's plant in Nebraska, USA, will have a production capacity of 180,000 MT PLA by the end of 2002. Waste management options and LCA data were presented. The triple bottom line of sustainability, i.e. economic, environmental and social impacts, is being fully considered in the development of PLA-based polymers.



Dr Alexander Steinbüchel of the WWU Münster presented his group's achievements in the biotechnological production of polyhydroxyalkanoates (PHAs), bacterial storage compounds for carbon and energy. The talk provided an overview of the possibilities and limits of metabolic engineering for production of PHAs. The use of transgenic plants to produce PHAs was also discussed and comparisons drawn between production in bacteria and transgenic plants.

Proteins are of course natural polymers and S. Guilbert of INRA in Montpellier described how proteins could be used as raw materials for bioplastics with a wide range of agricultural, agrifood, pharmaceutical and

medical industry applications. These protein-based plastics often have specific and unique optical, barrier and mechanical properties.

Robert van Tuil of the Netherlands described ATO's approach of utilising biotechnology in combination with established technologies to develop sustainable plastics either by the removal of bottlenecks in production to create a safe, efficient and cheaper process, or by the creation of biosynthetic performance polymers whereby polymer additives derived from natural raw materials are introduced into the process, creating polymers with enhanced sustainability.



Aspects of the standardisation of bioplastics in terms of biodegradability and compostability and how this fits with current EU legislation, for example the European Packaging Directive, were then discussed. Martin van der Zee, also of ATO, presented the range and value of logos and certification programmes for bioplastics materials. Bruno de Wilde of Organic Waste Systems in Belgium continued with a presentation on the biodegradability of polymers and packaging under conditions such as soil, marine and anaerobic digestion and the need for setting standards for acceptance of bioplastics in these environments.

The first day closed with a presentation by Gerald Scott on the scientific basis of standards for biodegradable plastics. Standards are needed to protect the environment, to provide a level playing field for business and to clarify competing claims for the benefit of the customer. This presentation comprehensively covered aspects of natural biodegradation routes, and went on to discuss biodegradation of polyethylene-based plastics. This presentation from a different perspective sparked a lively debate on the relative merits of conventional biodegradable plastics versus bioplastics.

Day two provided an opportunity for the presentation of commercial products and an account of the companies' approach in development of them. Many of the products were also on display in the trade show

with products ranging from biodegradable body bags to nappies, to biobags for municipal waste.

Changing the perspective of the conference, Julia Hailes asked 'what do consumers expect from bioplastics - is biodegradability a real benefit; is recycling better than being renewable or compostable; are plants actually better than oil; has consideration been given to the intensification of agriculture, possible use of GM plants etc?' The answers to these and other questions must obviously be given due consideration in the development of bioplastics for commercial and industrial applications. Domestic waste is a major challenge, and two innovative schemes for its management were presented, the Suffolk County Council Scheme in the UK and the Kassel Project in Germany. The conference ended with a look at some of the research projects currently in progress in Europe, and also Brazil.

Conference sessions were superbly chaired by Melvyn Askew, co-ordinator of the IENICA project, and Catia Bastiloi, who had the challenging task of managing some rather lively discussion. Networking is an essential part of IENICA events and there were plenty of opportunities during breaks, over lunch and at the conference dinner. The dinner also provided an opportunity to relax and enjoy the historic city of York at the Merchant Taylor's Hall, a splendid fourteenth century retreat for the wealthy cloth traders of the time.

The IENICA project is grateful to Europoint for their hard work in organising the conference and Teresa Lopes for organising such an interesting and stimulating programme, and most importantly our thanks to all the speakers and delegates who helped make this a successful and productive conference. Europoint invited delegates to the conference with the statement 'Bioplastics work!' - this meeting amply demonstrated that. Copies of the proceedings are available from Europoint or on the IENICA website (<http://www.csl.gov.uk/ienica> - Events page)

The conference was organised for IENICA by:



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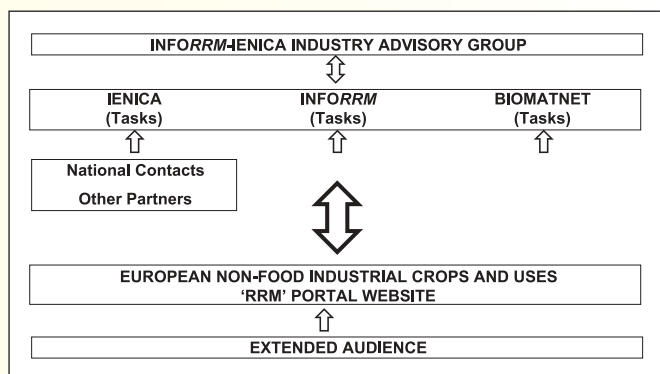
Visit the IENICA website at: www.csl.gov.uk/ienica

Industrialcrops.EU

Plans are well advanced within INFORRM-IENICA to launch a new European Portal for 'RRM' (renewable resources and materials). The proposal is to provide a common 'future proof' platform with a simple structure and a memorable brand name. In anticipation of the internet's long-awaited ".eu" (*dot EU*) TLD/top-level domain the name **industrialcrops.eu** (*industrial crops dot EU*) has been targeted.

Whether you are a newcomer to the European RRM arena or an experienced participant, this **industrialcrops.eu** Portal offers the definitive point of entry, via three major European Actions (see below), to the entire range of European activity. Select **INFORRM** for an overview of this landscape (leading to key players and products); select **IENICA** for detailed information on crops, markets, contacts etc., at the European and national level; select **BioMatNet** for links to EC funded research projects. The site also offers an introductory statement from the European Commission together with an overview chart of European interactions in renewable resources.

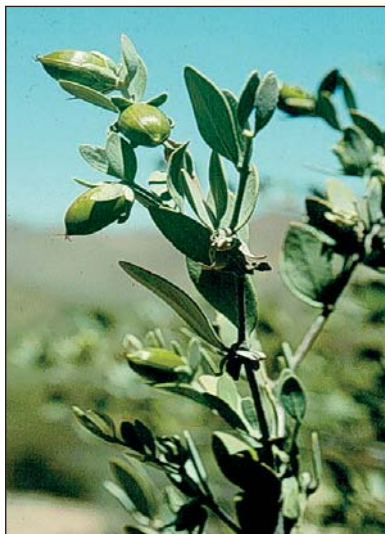
This Portal will be updated as research policy evolves and major new Actions are funded. Feedback and comments from the wider user community are also welcomed at this formative stage. We hope you will join us in this new coherent hierarchy:



For the immediate future, access will be via **www.industrialcrops.eu.com**, which will be activated imminently in preparation for INFORRM's attendance at 'ChemSpec Europe 2002' (The Messe, Basel, 26/27 June 2002). ChemSpec is Europe's leading speciality chemical event and it provides an excellent platform to extend the RRM audience to new users, including third countries.

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Commercial Production of Jojoba Seed and Oil in Israel



Jojoba plant with fruit



Ripening fruit

Jojoba (*Simmondsia chinensis*) is a perennial, evergreen woody shrub bearing seeds that contain 50-55% of a chemically unique wax known as jojoba oil. The oil is a mixture of mono-unsaturated long straight-chain esters of fatty alcohols and acids and is used mainly in the cosmetic industry. Commercial plantings have been carried out since 1980, mainly in the USA and Mexico, but most of the early plantings failed due to the use of non-selected seed material for planting, insufficient research of climatic effects on plant growth and flowering and insufficient knowledge of suitable cultural practices.

The jojoba plant was introduced to the desert areas in southern Israel, to the Negev, where it proved to be well adapted to the local climate - cool winters, rare frosts during the crucial months of February and March, low relative humidity during the hot dry summer, and high radiation levels. However, early commercial plantations established in Israel during 1980-2 from seed were abandoned due to low plant fertility, high incidence of non-productive male plants, lack of appropriate know-how and insufficient cultural practices.

An extensive research and development program has led to the agronomic success of jojoba in Israel in recent years. This involved the selection and screening of numerous jojoba clones in the Israeli Negev desert for the breeding of higher yielding cultivars, and extensive studies into growth habit, floral biology, fruit development, wax synthesis etc. Semi-commercial plantations were established and agronomic studies took place along with attempts to mechanise most field

operations. Methods for vegetative propagation of selected cultivars via cuttings and tissue culture were developed. This facilitated the multiplication of planting material for field tests and for up-scaling superior clones.

The current commercial jojoba plantations in Israel were established in 1990-1993. More recent plantations planted in 1999 contain mainly new selections of improved clones. The annual jojoba seed production in Israel in the years 1999-2001 was about 1000 tonnes, almost one third of world production. This yield was obtained from an area of 600 hectares, which comprises about 7.7% of the planted area in the world. The yield per hectare (up to 3.5 tonnes/ha) obtained by Israeli farmers is very high as compared with that obtained by farmers in Argentina or the USA (the main jojoba producers) and is expected to further improve. An economic evaluation taking into account all expenses showed a net return of US\$0.7/kg dry seed at a price of US\$2.5/kg dry seed with yields of 3 tonnes per hectare. Under the current conditions of Israeli agriculture, this is considered a good investment. The main constraint for increasing production is the size of the market. The cosmetic industry is the main consumer of jojoba oil and market prices depend upon its demand.

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Chemicals from Crops, are you Aware it's a Growth Industry?

Companies and organisations not directly involved in the field of renewable resources and materials (RRM) may have heard about the topic but may not be aware of the work being carried out and the opportunities generated by this subject. The Green Chemistry Network and the Central Science Laboratory aim to rectify this by delivering a course on the subject: "Chemicals from crops: the green and sustainable option?" This course is targeted at agriculture, environment and sustainability managers in supermarkets, local authorities, the chemical industry and environment agencies.

It provides a broad overview of the supply chain, embracing legislative drivers; primary production and harvesting of crops; extraction and purification and uses in the chemical industry.

The course provides opportunities to scope renewables development based upon case studies and examples.

The one-day course will run on October 30th 2002 at the Central Science Laboratory, Sand Hutton near York. The conference fee will be approximately £50 including lunch. Delegates will receive access to the course website and a CD containing all the lecture material and accompanying notes.

For more information or to register contact:

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FORTHCOMING INDUSTRIAL CROPS EVENTS

4-8 June 2002

7th World Conference on Biodegradable Polymers and Plastics

Pisa, Italy

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9-11 June 2002

Narossa - International Trade Fair and Conference for Renewable Resources and Plant Biotechnology

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