

**The multidisciplinary EU-PEARLS consortium, a collaborative network of European research organisations and industries, is developing alternatives to natural rubber from *Hevea brasiliensis*. Its coordinator Dr Hans Mooibroek explains the importance of the project and says the upcoming conference, *The Future of Natural Rubber 2010*, in the French town of Montpellier, will focus on new sources of natural rubber, specifically guayule and Russian dandelion, as Europe seeks to reduce dependence on Asian rubber**

# FUTURE OF NATURAL RUBBER

PTA News Bureau

*What is the current status of the EU-PEARLS project to develop alternative natural rubber sources for Europe?*

One of the plants that we are studying is *Taraxacum*. We have obtained new germplasm from Kazakhstan. The germplasm that is labelled as *Taraxacum kok-saghyz* in botanical gardens and collections actually is a different species not useful for rubber production and breeding. A paper published by members of our consortium — Dirk Prüfer and co-workers — shows that latex flow can be improved by knocking out the polyphenoloxidase. Another paper provides a method to purify rubber particles and shows that *Taraxacum* contain high molecular weight rubber. This paper is a starting point for detailed biochemical work. The details of the genome map and the number of Expressed Sequence Tags (ESTs) are increasing. Another plant under consideration is Guayule. We are now cultivating several breeding lines in Montpellier, France and in Murcia in Spain. Research on proteomics, breeding and extraction is progressing

*What is the compulsion behind such project?*

One reason is strategic interest: Natural rubber is essential for many applications and cannot be replaced by synthetic rubber, except at a very high price. Today the production area is limited to South East Asia. The demand in Asia is strongly increasing. Synthetic rubber is based on oil, which is non-renewable and may have reached peak production in 2005. If not 2005, even the International Energy Agency now thinks it may happen in 2012. Another reason is climate change, which appears to affect South East Asia: Drought in Southern China and Indochina, heavy and persistent rains in Sumatra threaten

rubber production. There is also a trend of *Hevea* plantations being replaced by palm oil plantations.

*Do you think South American Leaf Blight (SALB) threat could threaten rubber production in South East Asia, the major source of global NR?*

SALB is a potential threat to NR production in South East Asia and Africa. However, quarantine has been successful for over a century, and may well continue to be successful. Nevertheless, traffic and trade among world regions are increasing steadily, which increase the chance that quarantine at some point, will fail.

**The compulsion to find alternatives to *Hevea brasiliensis* rubber is strategic interest: Natural rubber cannot be replaced by synthetic rubber. *Hevea* is limited to South East Asia and the demand is strongly increasing in Asia. Synthetic rubber is based on oil, which is non-renewable and may have reached peak production in 2005. Another reason is climate change: Drought in Southern China and Indochina and persistent rains in Sumatra. There is also a trend of *Hevea* plantations being replaced by palm oil**



Hans Mooibroek

*Besides Guayule and Russian dandelion, are you looking at other plants that could be potential sources of natural rubber?*

We are not looking at other plants in our project. We are certainly aware of the fact that if an additional source of natural rubber is required, other tropical trees and vines may well be suitable. However, these cannot be grown in Europe, and would also take time to develop. According to the current state of the art, the two species selected are considered most promising.

## Synthetic properties

*Why do you think synthetic rubber is not an optimal substitute for natural rubber? Can't stepped up research produce synthetic rubber that has all the characteristics of natural rubber?*

Natural rubber has properties that cannot be reproduced by synthetic rubber, except perhaps by expensive procedures for some major applications. For example, NR shows less build-up of heat from flexing and greater resistance to tearing when hot. Therefore, heavy duty tyres contain more NR than passenger car tyres. Styrene-butadiene rubber — the most common and cheapest synthetic rubber — has better heat and abrasion resistance, but suffers from poorer fatigue resistance, lower temperature flexibility and tensile

... continued on page 44

... continued from page 38

## FUTURE OF NATURAL RUBBER

strength than NR. Other synthetic rubbers—nitrile elastomers, neoprene, ethylene-propylene, urethane, silicone, etc— have other ranges of properties, some superior to NR, some inferior. Some are really good but simply too expensive.

*What is the current research on protecting *Hevea brasiliensis* from SALB, which could strike South-Asian countries anytime?*

South East Asia focusses on keeping the region free of SALB. SALB-research is carried out in Brazil with Michelin, and in Europe at CIRAD (French Agricultural Research Centre for International Development) and INRA (French: National Institute for Agricultural Research). The research focuses on breeding resistance into the rubber tree, but it is also identifying climates that allow *Hevea* to escape infection, or reduce the effects of infection.

*Do you think breakthroughs in guayule and Russian dandelion rubber production on economic scale could address price*

*volatility and availability of natural rubber?*

For now, rubber and latex from guayule and Russian dandelion are too expensive because the plants need further breeding, and the processing is more complicated. Therefore, it will probably take more than a decade before large-scale production can be expected. Furthermore, it would need support from structurally higher rubber prices. Increasing demand from China, India and other developing countries and reduced supply of NR due to climate change, competition with palm oil, of SR due to peak oil make this a likely scenario.

### Sustainability issues

*Can you explain the observations that development of European rubber crops could strengthen the goal of a sustainable industry as they can also be used for the production of energy or chemicals?*

In the end, life cycle analysis, which is becoming standard in judging whether a project is “sustainable” and which will

probably become obligatory, will decide if these rubber crops can contribute to developing a sustainable industry.

*I understand that a major thrust of EU-PEARLS project is the investigation of the biochemical pathways in rubber biosynthesis. Can you elaborate on this?*

Amongst the major biopolymers natural rubber has received relatively little attention concerning its biosynthesis: The identity of the rubber polymerases is still not unequivocal. In other words, it is quite likely that the cloned *cis-prenyltransferases* are in fact the elusive rubber synthase, but this has not been proven rigorously. Also, many details of the regulation of rubber synthesis, rubber molecular weight, and rubber properties are still unknown. Knowing more about the enzymes, proteins and precursors involved in rubber biosynthesis, and their regulation, can help in improving natural rubber sources by breeding or other methods. In addition, the identification of structural and regulatory genes directly or indirectly involved in rubber synthesis, molecular weight and in total biomass will be helpful for marker-assisted breeding activities

*What is the main focus of the upcoming conference The Future of Natural Rubber 2010 in Montpellier?*

The focus of the conference is on new sources of natural rubber, and specifically guayule and Russian dandelion. All aspects of developing these plants — from genetics and biochemistry, to breeding, agronomy, extraction, processing, main and by-products, economics, regulation and socio-economic aspects — will be discussed. In addition, it is expected that the conference will attract possible decision makers, investors and end-users that will be needed during the implementation phase. ▲