

## NOVEL BIODIESEL („TBK-BD“) SUMMARY

In their paper published in „The Plant Journal“ (2008, **54**, pp 593 – 607) entitled „Plant triacylglycerols as feedstocks for the production of biofuels“ Michigan State University researchers (Durrett et al.) declare that

„Acetyl TAGs are a modified TAG with a short two-carbon acetyl group rather than a longer acyl chain at the sn-3 position. This structure results in an oil of lower viscosity that has the potential to directly replace No. 4 diesel (a heavier grade). These unusual triacylglycerols are abundant in the seeds of some plant species, such as members of the genus *Euonymus* where they can form up to 98% of the seed oil. As with *Cuphea*, these species are not currently suitable for development as oilseed crops. Therefore, the transfer of enzyme(s) necessary for acetyl TAG production has been explored. To this end, a type 1 diacylglycerol transferase (DGAT1) involved in the production of acetyl glycerides has been isolated from developing seeds of *Euonymus alatus* (Milcamps et al., 2005). However, as with the previous examples, the heterologous expression of EaDGAT1 failed to yield high levels of acetyl TAGs.“ (pp. 601 – 602, TAG standing for Triacylglycerol).

In US patent no. 7 429 473 (2008, filed in 2006 by Milcamps et al.) the sequence of nucleic acids encoding a protein that has diacylglycerol acetyltransferase activity is being protected. However, neither this patent (43 pages), nor the referred 2005 paper by Milcamps et al. makes any mention of using such low-viscosity modified triglycerides for fuel purposes. As a matter of fact, we were the first to propose such triglycerides to that end, that is modified oils/fats partially containing short acyl (practically: acetyl) moieties in our 2007 February Hungarian patent application (WO2008096187), and patent already granted in Hungary as HU 226 873 (2010) and in South Africa 2009/06088 (2010).

We produce such modified triglycerides by way of interesterification of triglycerides with alkyl esters of short chain fatty acids (practically: with ethyl acetate), whereby a mixture of reduced molecular mass modified triglycerides (with lowered viscosities, superior cold properties, etc.) and alkyl esters of displaced biomass fatty acids (i.e. conventional biodiesel) are formed in an equilibrium reaction, the rate of transformation being controlled by sufficient excess of ethyl acetate. (Please note that while enzymatically only *one* acetyl group containing modified triglyceride can be produced, in our „chemical pathway“ we can attain any acetyl-content – statistically speaking – thus we are capable of manufacturing modified triglycerides applicable as substitutes of No. 2. diesel oil as well.) So in this case the glycerol backbone of biomass triglycerides is retained and becomes part of the fuel. Owing to this and also to incorporation of ethyl acetate, out of a unit of oil we get 15 – 17% more fuel, possessing far superior fuel properties over conventional biodiesel. For details, for engine and emission test results, etc. please see our website at [www.algaebiofuel.com](http://www.algaebiofuel.com) and [www.tbkbiodiesel.com](http://www.tbkbiodiesel.com)

In our patent (priority: Febr. 2007) we are seeking to protect both such mixtures of fatty acid alkyl esters with modified triglycerides, but also the use of such triglycerides as fuels or fuel additives in themselves. That is, we have priority over all cited and referred data. See our claims to that end. In Dec. 2008 Chevron filed two patent applications pertaining to the same chemical structures and methodology, as ours (under WO 2010/075220 and WO 2010/075222. : "Low melting point triglycerides for use as fuels"), thus verifying our approach.

In: [Biofuels, Bioproducts and Biorefining](#), Volume 2 Issue 2, 2008, pp. 155 – 174):

Gradual depletion of world petroleum reserves and the impact of environmental pollution of increasing exhaust emissions lead to the search for a suitable alternative fuels for diesel engines. The substitution of conventional fuels (gasoline, diesel) by renewable biofuels is considered a potential way to reduce pollution and to support the sustainable development of a country. Direct use of vegetable oil and animal fat is a promising alternative to solve these problems. An exhaustive review of the experiments in this area, carried out by several researchers in last three decades, is presented here. Different problems associated with the direct use of vegetable oil and animal fat and potential solutions from both public and private sectors are discussed. Some engine manufacturers have started to launch full-warranty engines with vegetable oil as fuel. It is expected that the competitive engine market will witness more intense research, resulting in the launch of more vegetable-oil engines with full warranties. The steep rise in food prices in recent years is concerning policy-makers and has raised the old 'food vs fuel' debate. It has been concluded that vegetable oil can probably only substitute small to medium portions of petroleum-based fuel due to future severe land-usage competition from food sector. This calls for intense research initiatives into the production of suitable fuel from non-edible vegetable oil, grown in wasteland. In this regard, *genetic engineering* may prove to be extremely effective in developing 'designer fuel'.

Thus until geneticists succeed in altering plants to produce such modified triglycerides for direct use as fuels (petrodiesel substitutes), our method will be the only feasible alternative to such combustibles. And once such oils are available from harvestable plants, our permission for their use is indispensable, once our patent will be granted. So he who owns this patent, will have all rights over the use of such modified oils for fuel purposes.

