The effects of PDAT overexpression and knockdown on *Arabidopsis thaliana* growth rate, activity of LPLAT type of enzymes and intensity of autophagy

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Agricultural and industrial utilisation of oilseed plants depends on their triacylglycerol (TAG) content and composition. TAG is synthesized in Kennedy Pathway by acylation of sn-3 position of diacylglycerol (DAG) via a DGAT-type of enzyme action. These enzymes utilized acyl-CoA as a fatty acid donor. There is however another way of TAG production catalyzed by a completely unrelated enzyme called PDAT (phospholipid:diacylglycerol acyltransferase). This enzyme takes part in TAG synthesis by transferring an acyl group from sn-2 position of phospholipid, e.g. phosphatidylcholine or phosphatidylethanolamine to sn-3 position of DAG. In some plant species PDAT's importance is on par with that of DGAT's. Preliminary experiments shown that PDAT overexpression had a rather small effect on the amount of TAG / mg seeds or leaves. However, Arabidopsis plants overexpressed PDAT grown faster than the control ones and produced more seeds. The current project aim to confirm this finding and to shed some light on the mechanism of this phenomenon.

As a byproduct of PDAT activity, inter alia, lysophosphatidylethanolamine (LPE) is formed. Thus, overexpression of this enzyme cause probably overproduction of LPE. This in turn can stimulate LPEAT (acyl-CoA:lysophosphatidylethanolamine acyltransferases) activity (in the preliminary research we have shown that it could be a true fact). On the other hand, it has been shown that LPEAT activity regulates the growth of Arabidopsis; overexpression stimulates growth and knockout had inhibitory effects. It was suggested that it can be done by regulation of autophagy intensity. Thus, the current project aim to detail study not only the effect of PDAT overexpression and knockout on Arabidopsis growth rate and lipids content and composition in different tissues but also on the LPLAT enzymes activity (especially LPEAT) and the intensity of autophagy. In the project, old lines of Arabidopsis overexpressing PDAT as well as a new created in the project will be used. The homozygous of PDAT knockout will be also selected. The different combinations of crossbreeding between Arabidopsis plants overexpressed or knocking-out PDAT and between the ones overexpressed or knocking-out LPEAT will be also done. During the seminar time, the current progress in the research will be presented.

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Apart from the theoretical values of the project in better understanding of the mechanism of plant lipid metabolism regulation, the obtained data could have also a practical application in the improvement of oilseeds plants.

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