

**MOLECULAR MECHANISM OF VIOLAXANTHIN DE-EPOXIDATION  
IN THE XANTHOPHYLL CYCLE AND ITS REGULATION BY  
MEMBRANE FLUIDITY**

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Temperature dependence of violaxanthin de-epoxidation was measured in unilamellar egg yolk phosphatidylcholine (PC) vesicles supplemented with monogalactosyldiacylglycerol (MGDG). The activity of violaxanthin de-epoxidase (VDE) strongly depended on the ratio of MGDG to PC in liposomes. The mathematical model of violaxanthin de-epoxidation was applied to calculate the probability of violaxanthin to zeaxanthin conversion at different phases of de-epoxidation reactions. Measurements of de-epoxidation rate and EPR-spin label study at different temperatures revealed that dynamic properties of the membrane are important factor which controls conversion of violaxanthin to antheraxanthin and that the availability of violaxanthin for de-epoxidation is a diffusion-dependent process controlled by membrane fluidity. <sup>31</sup>P-NMR studies revealed that MGDG induced formation of reversed hexagonal phase in PC-MGDG liposomes. In a comparative studies we demonstrated that phosphatidylethanolamine (PE), another hexagonal structure forming lipid, stimulated more than MGDG the VDE activity. A model of the molecular mechanism of violaxanthin de-epoxidation where the reversed hexagonal structures (mainly created by MGDG) are the sites for violaxanthin conversion to antheraxanthin and zeaxanthin is proposed. The significance of presented results for understanding the mechanism of violaxanthin de-epoxidation in native thylakoid membranes is discussed.