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Increasing the algae biomass production yield for energetic purpose through regulation of ion channels.

Algae can provide renewable biofuels such as methane (produced by anaerobic digestion of algal biomass), biodiesel (derived from algal oil) or hydrogen (produced during photo-biological processes) (Spolaore et al., 2006; Gavrilescu and Chisti, 2005; Galagher, 2011; Kapdan and Kargi, 2006; Kumar et al.,2013). Algae grow fast in waste lands and are interesting alternative to other plant or microbial derived renewable energy sources.

Mitchell chemiosmotic theory predicts that both in mitochondria and in thylakoids of chloroplasts the energy is stored in proton motive force consisting of electrical potential and pH difference. Proton motive force is used to produce ATP both in mitochondria and in thylakoids. To achieve ΔpH gradient transport of protons must be accompanied by counter transport of cations. Both in case of mitochondria and in thylakoids (Checchetto et al., 2012, 2013) it is the potassium ion which move in opposite direction to protons via specialized ion channels. While there is a limited knowledge on plant ion channels mitochondrial ion channels are well described (Bednarczyk, 2012) especially an ATP-regulated potassium channel (Bednarczyk et al., 2008) and a large-conductance Ca^{2+}-regulated potassium channel (Bednarczyk et al., 2013). There are also similar potassium channels in thylakoid membranes. Our experience in studying potassium ion channels of mitochondria (Szewczyk et al, 2010) its blockers and activators will be applied to study growth of algae. It is expected that selective activator of thylakoid potassium channel should increase ΔpH value and extend ATP production during dark phase. On the contrary the blockers of these channels are likely to decrease the biomass production.

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