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Supplementary material

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Molecular and cellular mechanisms of diatom response to environmental changes

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Supplementary table 1. Diatom response to different culture conditions

Conditions	Effects	Study
Silicon deficiency	Thinning of the shell/stop division	Vaulot et al., 1987 Paasche, 1973
	Increased expression of *SIT*	Mock et al., 2008; Wang et al., 2017
	Photosynthesis disturbance, oxidative stress	Bucciarelli et al., 2003
	Increased pyruvate metabolism	Thangaraj et al., 2019
	Growth of metacaspase expression on the second day of cultivation, PCD markers on the ninth day (DNA fragmentation, externalization of phosphatidylserine); Vacuolization, swelling of mitochondria; On the seventh day, the cells are empty with an intact membrane	Wang et al., 2017
Iron deficiency	Replacement of iron-containing proteins	Ferreira et al., 1994; Mckay et al., 1999
	Increase in I*SIP2a* expression	Morrissey et al., 2015
	Disruption of electron transport through photosystem II, oxidative stress	Bidle et al., 2008; Peers et al., 2004
	Inhibition of the respiratory activity of mitochondria	Allen et al., 2008
	Increasing Si consumption	Luo et al., 2014
	Increase in metacaspase expression, PCD markers (DNA fragmentation, externalization of phosphatidylserine); Vacuolization, organelle degradation, chromatin condensation; Empty cells with intact membrane on the 6th day of iron deprivation	Bidle et al., 2008; Luo et al., 2014
Nitrogen deficiency	Reduced nitrate recovery; Increases the concentration of urease, the synthesis of ornithine; Increase in expression of peptidases	Hockin et al., 2012
	Decreased synthesis of the light harvesting complex	Hockin et al., 2012; Yang et al., 2014
	Accumulation of neutral lipids	Lin et al., 2017
	Increase in metacaspase expression, PCD markers (DNA fragmentation, externalization of phosphatidylserine);	Berges et al., 1998; Lin et al., 2017
	Vacuolization, swelling of the mitochondria; Empty cells with intact membrane on the 6th day of nitrogen deprivation	Wang et al., 2020

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Phosphorus deficiency	The composition of transport membrane proteins decreases, membrane phospholipids are replaced	Feng et al., 2015
	Activates alkaline phosphatase and phospholipases	Martin et al., 2011; Zhang et al., 2016
	The activity of photosynthesis changes (in *P. tricornutum*, the expression of proteins necessary for this decreases, while in *S. costatum* – increases)	Feng et al., 2015 Zhang et al., 2016
	Vacuolization, swelling of the mitochondria, organelle degradation; Empty cells with intact membrane on the 6th day of phosphorus deprivation; Increase in metacaspase expression, PCD markers (DNA fragmentation, externalization of phosphatidylserine);	Feng et al., 2015 Wang et al., 2020
	Accumulation of neutral lipids	Yang et al., 2014
Infochemicals	Oxidative stress, increased metacaspase expression, PCD markers (DNA fragmentation, externalization of phosphatidylserine);	Casotti et al., 2005; Gallina et al., 2015; Creveld van et al., 2021
	Accumulation of neutral lipids	Dolch et al., 2017
	Granular cytoplasm	Casotti et al., 2005
Algicidal bacteria	Production of antibacterial substances	Desbois et al., 2008; Pepi et al., 2017; Ribalet et al., 2008; Meyer et al., 2018; Paul et al., 2013
	Accumulation of neutral lipids, DNA fragmentation; Nuclear membrane degradation, intact chloroplasts and mitochondria	Bedoshvili et al., 2021
	Destruction of the cell shell	Bedoshvili et al., 2021; Wang et al., 2016
	Destruction of chloroplasts and mitochondria vacuolization, degradation of organelles	Wang et al., 2016
Viruses	Stop blooms	Nagasaki et al., 2004; Tomaru et al., 2009
	Stress factors amplify the impact of the virus	Kranzler et al., 2019
	In other phytoplankton: Activation metacaspase, cell shrinkage, DNA fragmentation	Bidle et al., 2007; Liu et al., 2018; Vardi et al., 2009
Temperature	The efficiency of photosynthesis decreases	Falk et al., 1996
	The concentration of chlorophyll *a* decreases	Kudo et al., 2008
	Thylakoid lipids are destroyed	Feijão et al., 2018
Darkness	The formation of resting cells – metabolic change, stop carbon fixation	Schaub et al., 2017; Veuger et al., 2011; Kennedy et al., 2019
	Use of stored lipids, carbohydrates and proteins as energy sources	Schaub et al., 2017
	Nitrate accumulation	Kamp et al., 2011