



# Effect of saline irrigation on fatty acid composition and desaturases genes expression in olive fruit mesocarp

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**Introduction** *Olea europaea* L. fruit is the major oleaginous fruit source of the Mediterranean area, where salinity is a huge environmental problem. Anyway, relative few information are available in terms of fatty acid desaturases pathway regulation under salt stress. The aim of this work is to investigate the effect of salinity on fatty acid desaturases pathway in olive flesh at different maturation stages in five-years old plants (Leccino cv - salt sensitive).

## Material and Methods

Plants were grown in pots, fertirrigated three times with Olive Medium solution. Treatments were performed applying 0 and 80 mM of NaCl in distilled water, from fruit pit hardening (11 weeks after flowering) to veraison (22 weeks after flowering). Fatty acid profile (GC-method) and desaturases gene expression analysis (Real Time PCR) was performed in all Maturation Groups (MG).

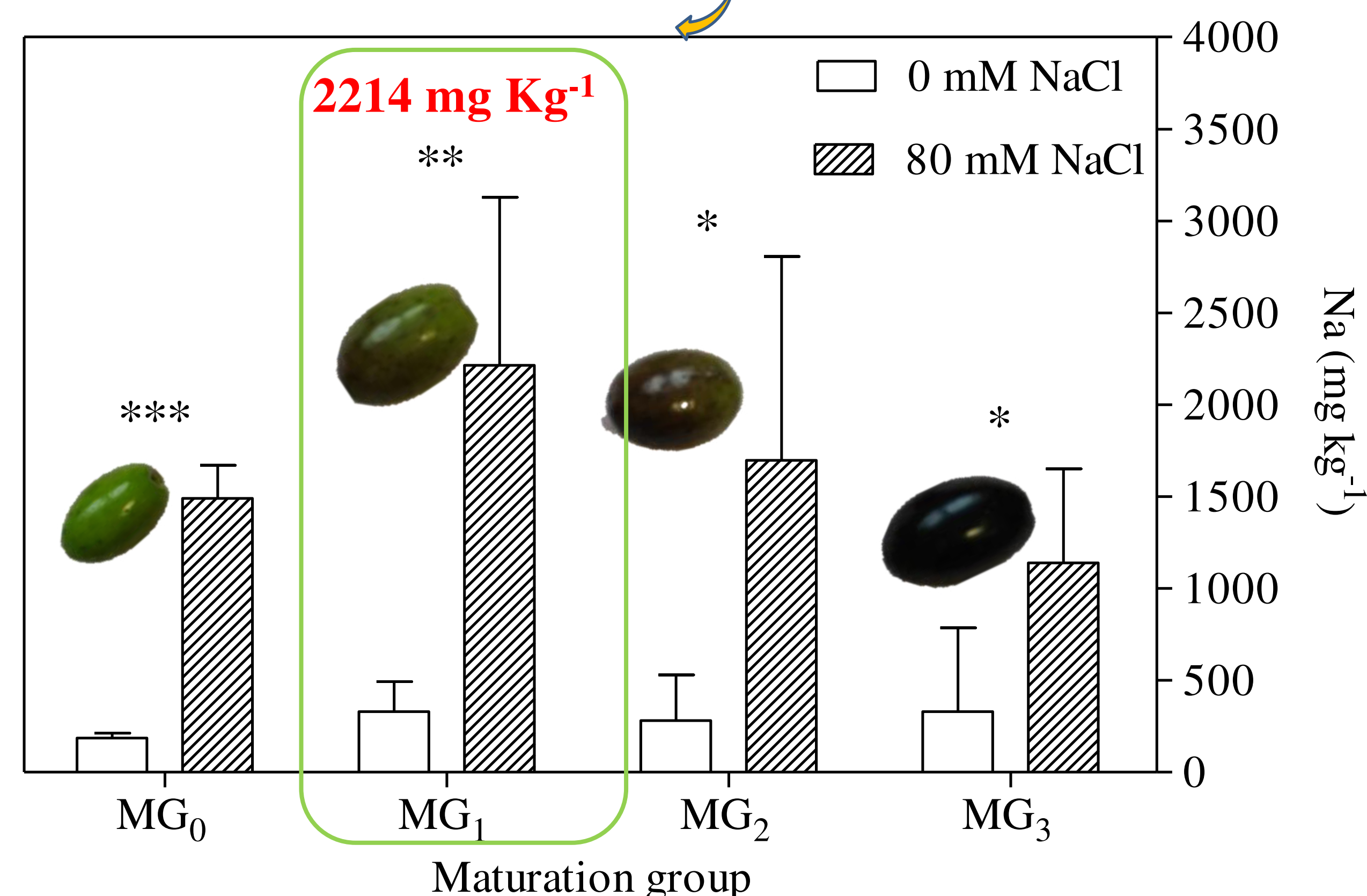
## Results and Discussion

Reduction in **Fv/Fm** (-8%) and **Electron Transport Rate** (reduced by half) recorded at the end of experiment indicate the stress perception in 80 mM NaCl treated plants (Table 1).

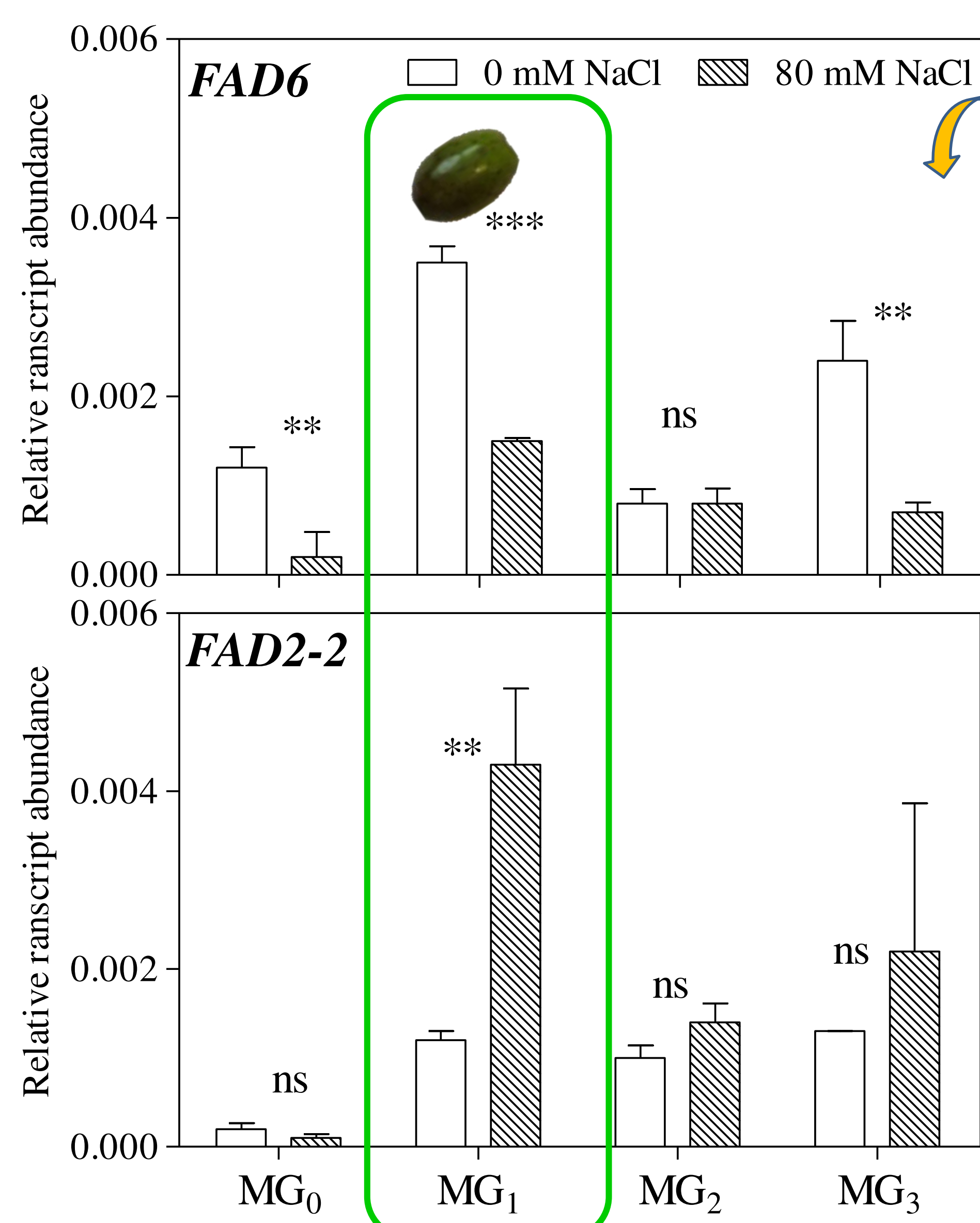
**Table 1.** Maximum photosynthetic efficiency (Fv/Fm) and ETR ( $\mu\text{mol m}^{-2} \text{s}^{-1}$ ) determined at the end of the experiment in leaf close to infructescence. Values are the means  $\pm$  SD (n=8). Results were analysed by two tailed *t*-test. \*\*\*, P<0.001.

	NaCl		<i>t</i> -test
	0 mM	80 mM	
Fv/Fm	0.80	0.73	***
ETR	610.7	312.3	***

Na<sup>+</sup> concentration in treated fruit mesocarp reach the maximum in **MG<sub>1</sub>** stage (Figure 1).



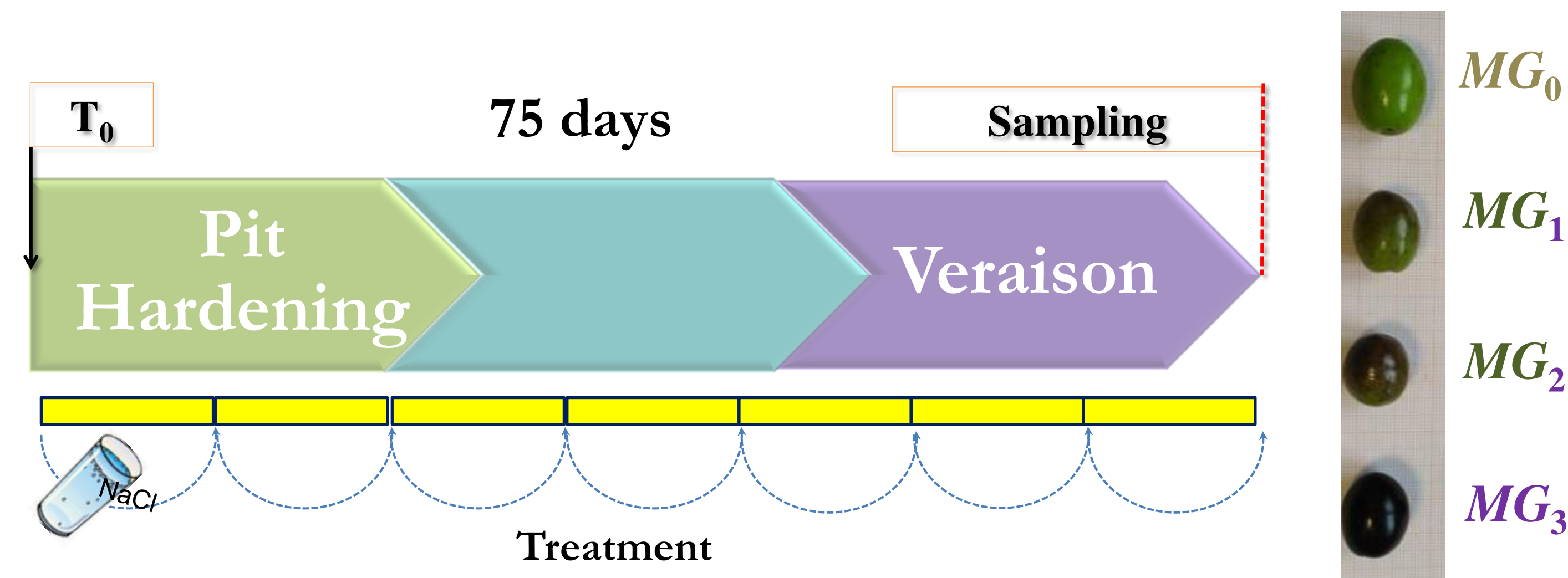
**Figure 1.** Na concentration in flesh of fruits in different maturation groups after 75 days from the beginning of the experiment. Data (n=3) are means  $\pm$  SD. For each maturation group data were analyzed by two tailed *t*-test. \*\*\*, P<0.001; \*\*, P<0.05; \*, P<0.05.



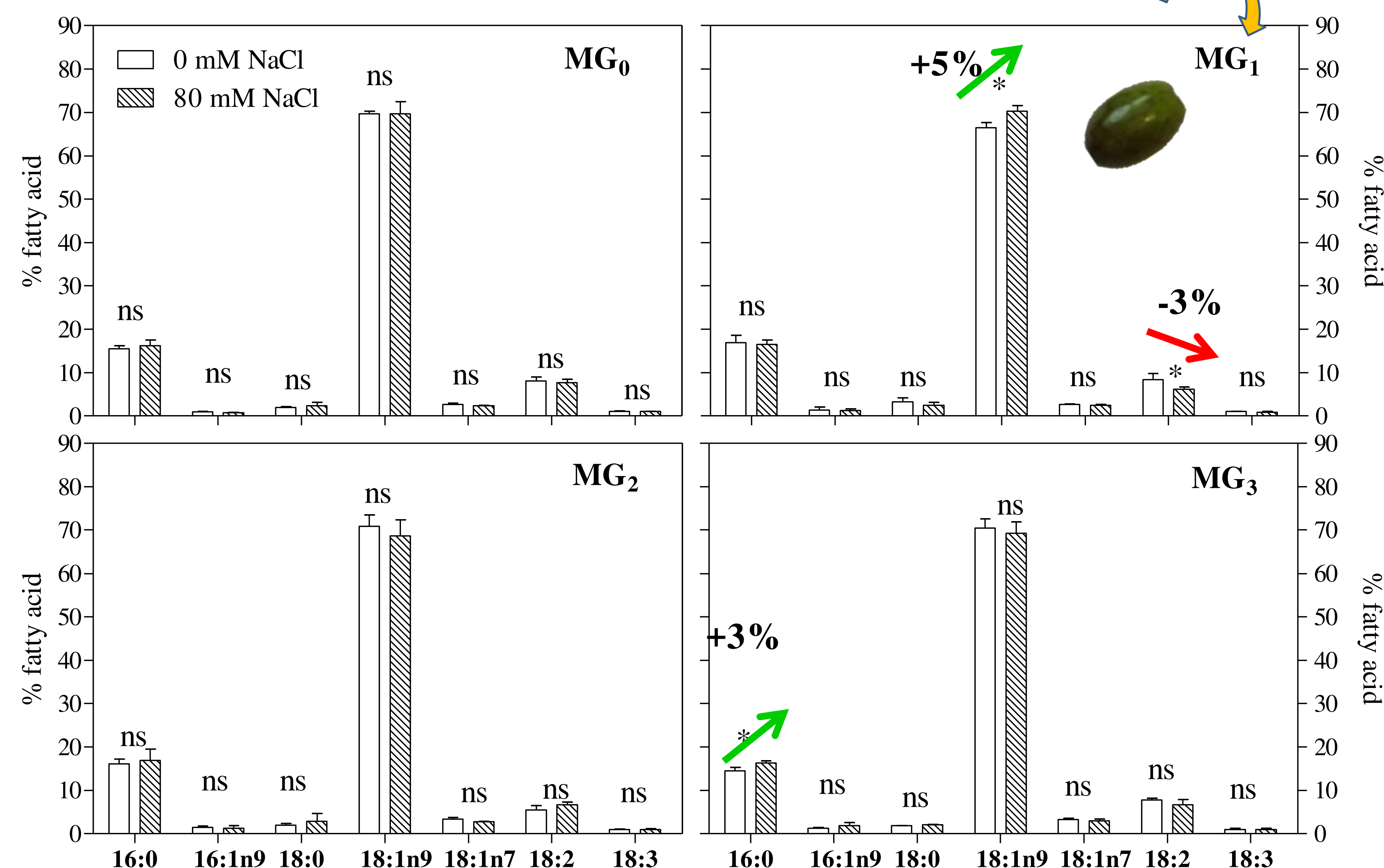
Fatty Acid Desaturases genes pathway is salt-regulated. In particular, **down-regulation of FAD6** in **MG<sub>1</sub>** treated fruit could be related to increase of 18:1n9

FAD2-2 **up-regulation** in **MG<sub>1</sub>** treated fruit confirm the importance of FAD in membranes integrity under stress.

**Figure 3.** FAD6 and FAD2-2 relative transcript abundance in olive fruit mesocarp from different maturation groups (MG<sub>0</sub>, MG<sub>1</sub>, MG<sub>2</sub>, MG<sub>3</sub>) after 75 days (165 DAF) of 80 mM NaCl and 0 mM NaCl treatments. Data (n=3) are means  $\pm$  SD. Data were analyzed with two tailed *t* test. \*\*\*=P<0.001; \*\*=P<0.01; \*=P<0.05; ns=not significant.



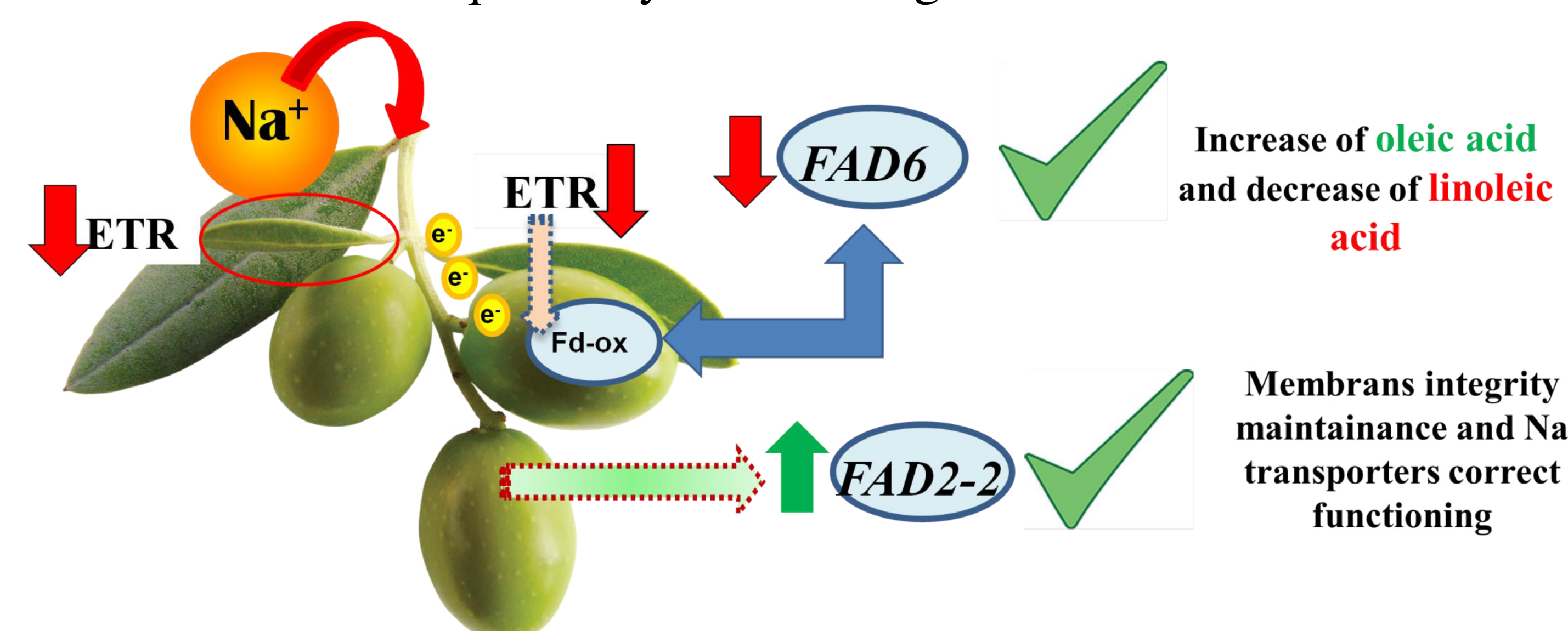
Fatty acid composition in olive mesocarp report oleic and linoleic changes in **MG<sub>1</sub>** treated fruit mesocarp (Figure 2).



**Figure 2.** Fatty acid composition (%) in each maturation group (MG) of Leccino mesocarp tissue after 75 days (165 DAF) of 80 mM NaCl treatments in comparison to control (0 mM NaCl). 16:0 (palmitic acid), 16:1n9 (palmitoleic acid), 18:0 (stearic acid), 18:1n9 (oleic acid), 18:1n7 (asclpic acid), 18:2 (linoleic acid), 18:3 (linolenic acid). Data (n=3) are means  $\pm$  SD. For each maturation group data were analyzed by two tailed *t*-test. \*, P<0.05; ns=not significant.

## Conclusions

In Leccino salt treated plants the olive fruit at early-veraison stages of maturation (MG<sub>1</sub>) results sensible to 80 mM NaCl treatment. ETR recorded in the closest leaf to infructescence could be related to the more oxidized state of Ferridoxin and consequentially to **down-regulation of FAD6**.



Up and down-regulation of all the others desaturases (*Oe SAD1,2,3; FAD7-1, FAD 7-2, FAD3-A*) studied is not related to changes in fatty acid profile (putative post-transductional modification).