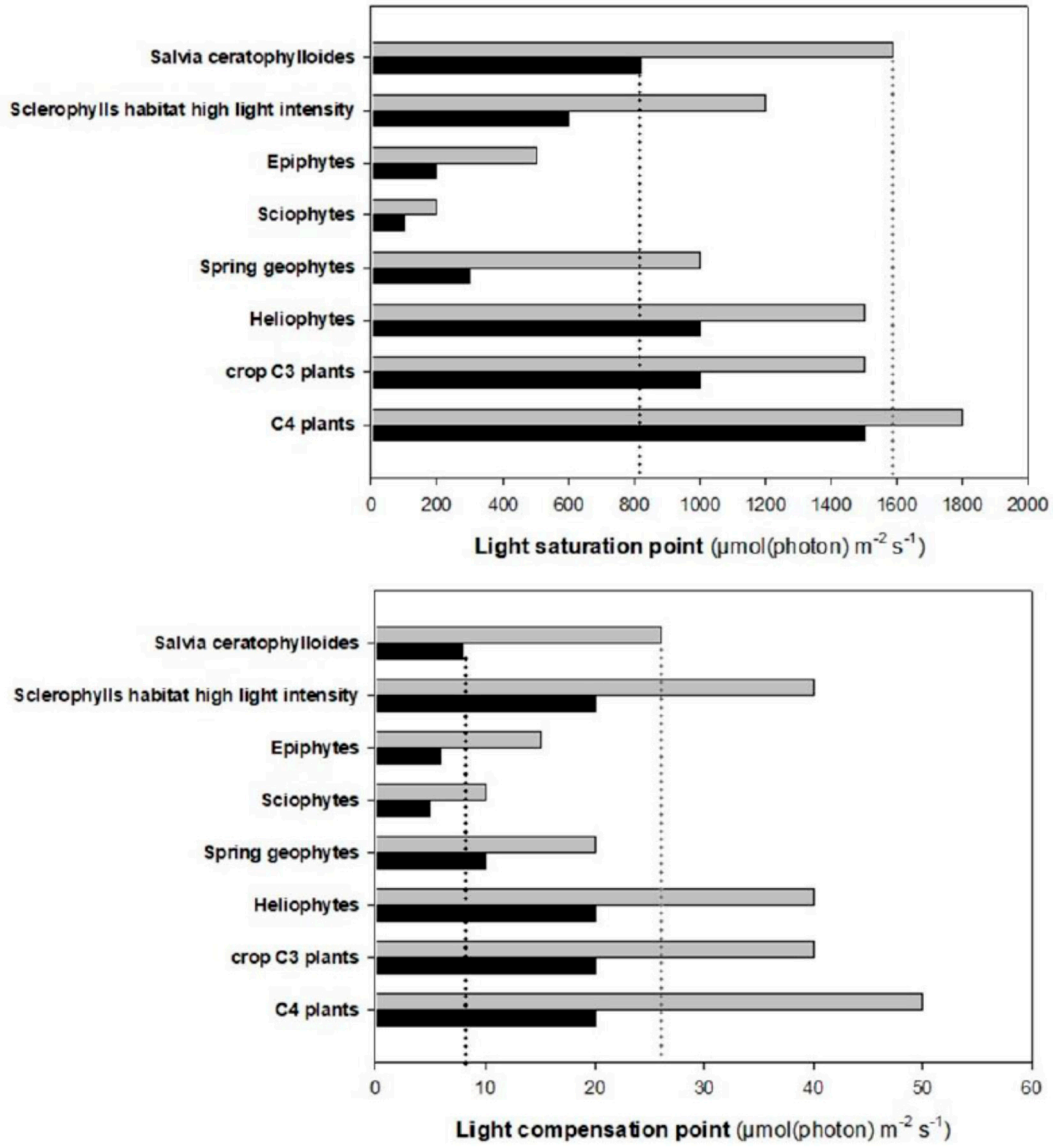


**Figure S1**. Light saturation point (µmol(photons) $m^{-2}$ $s^{-1}$) (upper panel) and light compensation point (µmol(photons) $m^{-2}$ $s^{-1}$) (bottom panel) of different plant functional groups. The data [minimum (■) and maximum value (▒)] are derived from Larcher [80]. The dotted lines are drawn for a better comparison with the minimum and maximum value of *Salvia ceratophylloides*.

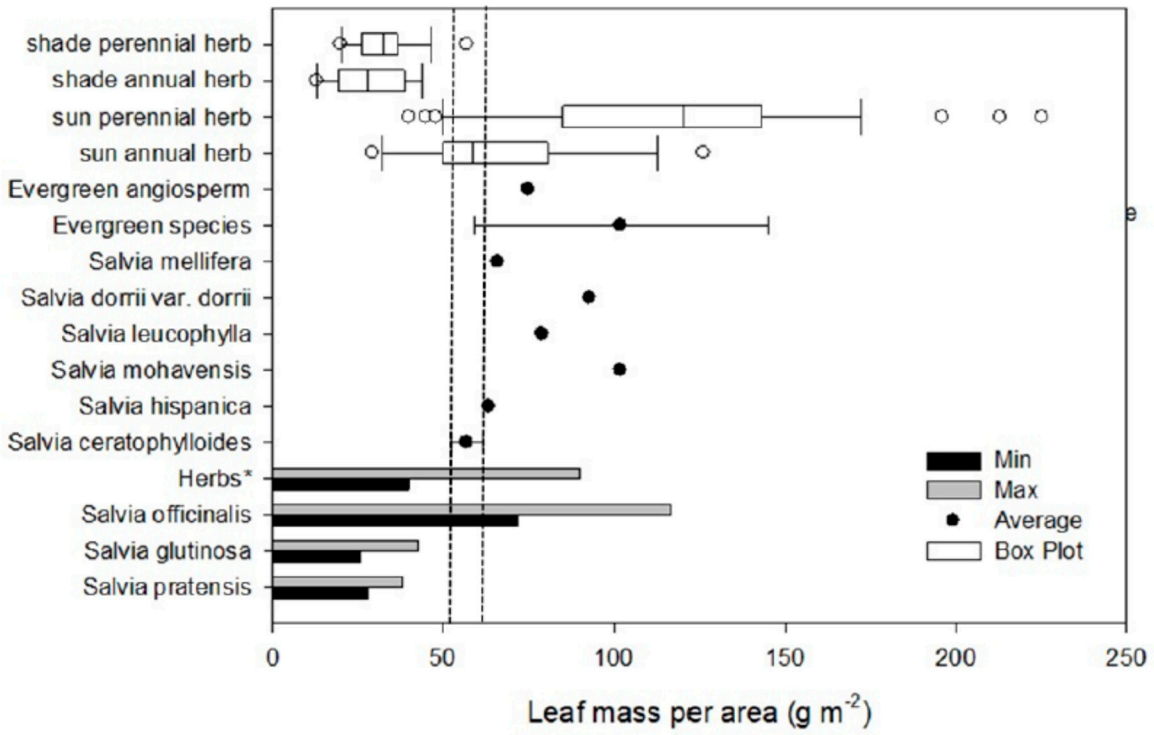


**Figure S2**. Leaf mass per area (g m-2) of sun- and shade-species herbs, evergreen angiosperm and species, herbs and different *Salvia* species. The data of LMA of Salvia species, herbs, evergreen angiosperm and species are indicated by minimum (▮) and maximum value (▮) or by the average (black plot point and the standard deviation where reported)] and have been derived from Martins et al. [82] for *S. officinalis*, Mommer et al. [34] for S. pratensis, Paz´-Dyderska et al. [35] for *S. glutinosa*, Goergen et al. [33] for *S. hispanica*, Knight and Ackerley [31] for *S. mohavensis*, *S. leucophylla*, *S. dorrii* var. dorrii and *S. mellifera*, Poorter et al. [29] for herbs, Duursma et al. [81] for evergreen angiosperm and de la Riva et al. [30] for evergreen species. Box plots point out the distribution of LMA values as observed for a wide range of sun- and shade-species herbs both annual and perennial, with the bottom and top part of the box indicating the 25$^{th}$ and 75$^{th}$ percentile, respectively, the two whiskers the 10$^{th}$ and the 90$^{th}$ percentile, respectively, and the horizontal line within the box the median value. The data for the box plot are derived by scientific literature as indicated in Table S1. The dotted lines have been drawn for better comparisons and pointed out the range of LMA values of *S. ceratophylloides*.

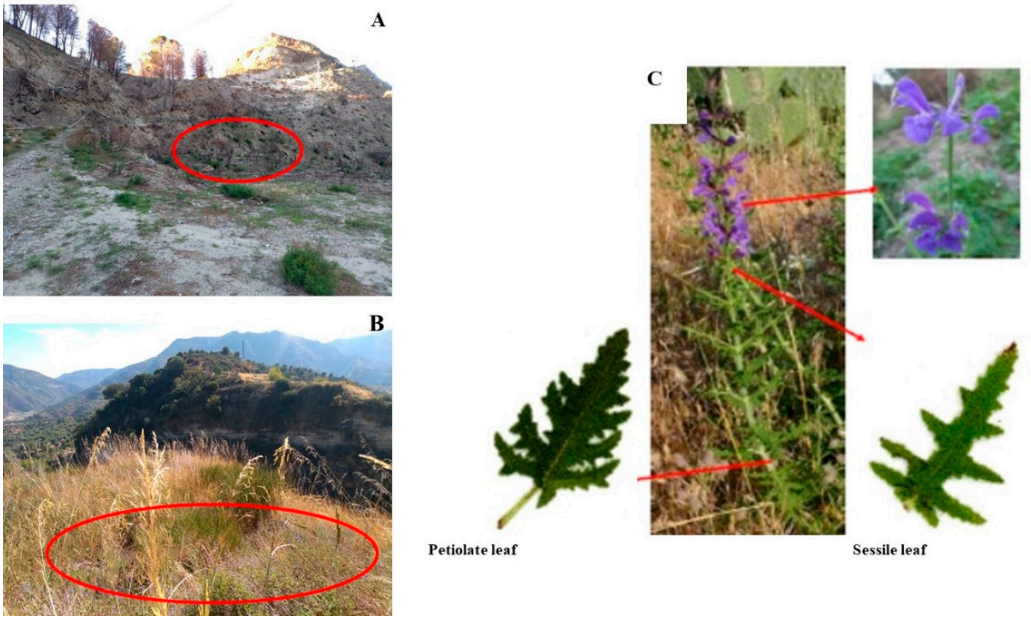


**Figure S3**. - Plants of *Salvia ceratophylloides* in the two sites, Mosorrofa [Mo] (A) and Puzzi [Pu] (B). The red circles indicate the places where the *Salvia ceratophylloides* plants have been discovered. (C) Individual plant of *Salvia ceratophylloides* and different leaves: petiolate (P) and sessile leaf (S)

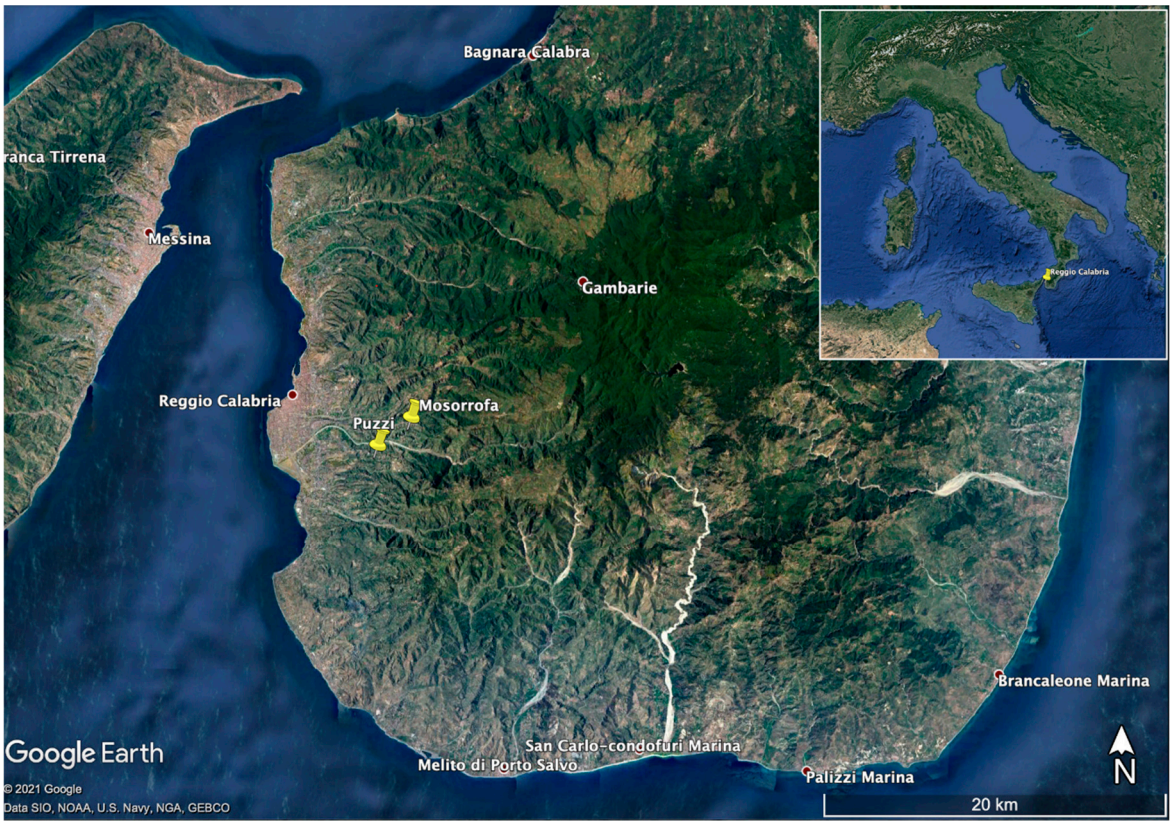


**Figure S4**. - Distribution map of *Salvia ceratophylloides*.

**Table S1 –** Two-way ANOVA results and chemical characterization (average and error standard within brackets) of volatile organic compounds in fresh sessile and petiolate leaves of *Salvia ceratophylloides* harvested in two different sites [Mosorrofa (Mo) and Puzzi, (Pu)]. Different lower-case letters indicated significant differences at $p < 0.05$ among the average along the rows (Tukey' test) and they have been only reported when the LT × Sit interaction was significant. The bold identify the statistically significant factors and/or their interaction.

| | **Compound** | **Chemical classes** | **#Statistics** | **Sessile** | | **Petiolate** | |
|---|---|---|---|---|---|---|---|
| | | | | **Pu** | **Mo** | **Pu** | **Mo** |
| 1 | Camphene | Monoterpene | LT 0.75$^{NS}$<br>Sit 0.64$^{NS}$<br>LT × Sit 1.25$^{NS}$ | 468 | 141 | 130 | 184 |
| 2 | Camphor | | LT 2.78$^{NS}$<br>Sit 4.82$^{NS}$<br>LT × Sit 0.86$^{NS}$ | 1776 | 368 | 606 | 34 |
| 3 | Limonene | | LT 5.30$^{NS}$<br>Sit 1.33$^{NS}$<br>LT × Sit 0.74$^{NS}$ | 77187 | 72261 | 53128 | 19515 |
| 4 | p-Cymene | | **LT 7.78***<br>**Sit 14.16****<br>LT × Sit 0.21$^{NS}$ | 195813 | 82392 | 108569 | 19607 |
| 5 | Pinocarvone | | LT 0.04$^{NS}$<br>**Sit 6.57***<br>LT × Sit 0.07$^{NS}$ | 2406 | 987 | 2444 | 696 |
| 6 | Sabinene | | **LT 11.80****<br>Sit 0.34$^{NS}$<br>LT × Sit 1.70$^{NS}$ | 554775 | 873306 | 195242 | 73210 |
| 7 | Terpinolene | | **LT 12.40****<br>Sit 0.40$^{NS}$<br>LT × Sit 3.09$^{NS}$ | 128554 | 218320 | 62198 | 19784 |
| 8 | trans-Sabinene hydrate | | LT 0.00$^{NS}$<br>Sit 0.28$^{NS}$<br>LT × Sit 3.73$^{NS}$ | 3086 | 4773 | 5342 | 2381 |
| 9 | trans-α-Ocimene | | LT 0.56$^{NS}$<br>Sit 3.02$^{NS}$<br>LT × Sit 0.04$^{NS}$ | 4784232 | 2005449 | 3790259 | 292998 |
| 10 | α-Pinene | | LT 1.04$^{NS}$<br>Sit 0.68$^{NS}$<br>LT × Sit 0.60$^{NS}$ | 548 | 104 | 50 | 36 |
| 11 | α-Terpinene | | LT 0.01$^{NS}$<br>Sit 5.21$^{NS}$<br>LT × Sit 6.02$^{NS}$ | 1116 | 1202 | 2418 | 22 |
| 12 | α-Thujene | | LT 3.83$^{NS}$<br>Sit 4.44$^{NS}$<br>LT × Sit 3.74$^{NS}$ | 1186 | 114 | 153 | 108 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | β-Myrcene | | LT 2.54$^{NS}$<br>Sit 0.15$^{NS}$<br>LT × Sit 0.01$^{NS}$ | 10189 | 8949 | 4114 | 2208 |
| 14 | β-Ocimene | | LT 0.54$^{NS}$<br>Sit 3.61$^{NS}$<br>LT × Sit 0.38$^{NS}$ | 3309 | 978 | 2059 | 868 |
| 15 | β-Phelladrene | | LT 0.80$^{NS}$<br>Sit 3.86$^{NS}$<br>LT × Sit 0.60$^{NS}$ | 1327 | 167 | 620 | 117 |
| 16 | β-Pinene | | **LT 7.30***<br>Sit 0.47$^{NS}$<br>LT × Sit 1.73$^{NS}$ | 92968 | 150052 | 53391 | 35502 |
| 17 | γ-Terpinene | | **LT 5.40***<br>Sit 0.19$^{NS}$<br>LT × Sit 0.04$^{NS}$ | 16341 | 13366 | 4610 | 3508 |
| 18 | cis-Pinen-3-ol | monoterpene alcohol | LT 1.40$^{NS}$<br>Sit 1.13$^{NS}$<br>LT × Sit 1.46$^{NS}$ | 882 | 51 | 7 | 60 |
| 19 | Eucalyptol | | LT 0.42$^{NS}$<br>Sit 0.00$^{NS}$<br>LT × Sit 1.52$^{NS}$ | 124492 | 278959 | 194614 | 53771 |
| 20 | Isoborneol | | LT 1.48$^{NS}$<br>Sit 4.42$^{NS}$<br>LT × Sit 1.48$^{NS}$ | 7041 | 156368 | 7160 | 46949 |
| 21 | α-Terpineol | | **LT 8.13***<br>**Sit 12.91****<br>**LT × Sit 9.04*** | 10220$^{b}$ | 80003$^{a}$ | 11854$^{b}$ | 18054$^{b}$ |
| 22 | D-Germacrene | sesquiterpene | LT 0.11$^{NS}$<br>Sit 3.47$^{NS}$<br>**LT × Sit 4.22*** | 2554$^{a}$ | 169$^{b}$ | 1102$^{a}$ | 1218$^{a}$ |
| 23 | α-Caryophyllene | | LT 0.62$^{NS}$<br>Sit 3.43$^{NS}$<br>LT × Sit 0.00$^{NS}$ | 43235$^{a}$ | 19311$^{a}$ | 33115$^{a}$ | 8972$^{a}$ |
| 24 | α-Copaene | | LT 0.62$^{NS}$<br>**Sit 11.05***<br>LT × Sit 0.67$^{NS}$ | 3517 | 601 | 2385 | 625 |
| 25 | α-Cubebene | | **LT 8.21***<br>**Sit 19.35****<br>LT × Sit 1.02 | 4460201 | 1371705 | 2247264 | 312465 |
| 26 | α-Muurolene | | **LT 9.49***<br>Sit 0.56$^{NS}$<br>LT × Sit 0.99$^{NS}$ | 14382 | 15236 | 7105 | 1038 |
| 27 | β-Caryophyllene | | LT 1.56$^{NS}$ | 30708 | 18290 | 19500 | 12669 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sit 2.04$^{NS}$<br>LT × Sit 0.17$^{NS}$ | | | | |
| 28 | β-Copaene | | LT 2.46$^{NS}$<br>Sit 2.74$^{NS}$<br>LT × Sit 2.19$^{NS}$ | 1001 | 100 | 126 | 74 |
| 29 | (z)-Hex-3-en-1-ol | alcohol | LT 0.06$^{NS}$<br>Sit 4.29$^{NS}$<br>LT × Sit 0.06$^{NS}$ | 2721741 | 7008 | 2159260 | 8617 |
| 30 | 1-Octen-3-ol | | LT 0.05$^{NS}$<br>Sit 3.20$^{NS}$<br>LT × Sit 0.13$^{NS}$ | 22710 | 12017 | 23730 | 7653 |
| 31 | 2-Propenal | aldehyde | LT 0.89$^{NS}$<br>Sit 1.20$^{NS}$<br>LT × Sit 0.87$^{NS}$ | 900 | 94 | 153 | 88 |
| 32 | Isovaleraldehyde | | **LT 6.10***<br>Sit 0.52$^{NS}$<br>LTxSit 0.52$^{NS}$ | 81876770 | 46391341 | 3426789 | 3466464 |
| 33 | Octenal | | LT 2.94$^{NS}$<br>Sit 1.40$^{NS}$<br>LT × Sit 0.16$^{NS}$ | 10441 | 7566 | 6602 | 5171 |
| 34 | α-Methyl-n-Butanal | | LT 5.19$^{NS}$<br>Sit 0.00$^{NS}$<br>LT × Sit 0.02$^{NS}$ | 32740199 | 30174050 | 3454460 | 4492251 |
| 35 | 5-Methylheptan-3-one | keton | **LT 5.70***<br>Sit 0.21$^{NS}$<br>LT × Sit 0.08$^{NS}$ | 7776 | 8204 | 1578 | 3291 |
| 36 | Pentan-3-one | | **LT 7.73***<br>Sit 2.44$^{NS}$<br>LT × Sit 1.20$^{NS}$ | 321989 | 649080 | 114170 | 171753 |
| 37 | β-tujone | | **LT 17.37****<br>**Sit 6.21***<br>**LT × Sit 12.54**** | 65370$^{b}$ | 168599$^{a}$ | 54660$^{b}$ | 36692$^{b}$ |
| 38 | (3z)-3-Hexenyl acetate | Aliphatic esters | LT 3.58NS<br>Sit 5.09NS<br>**LT × Sit 5.46*** | 1253$^{a}$ | 0$^{b}$ | 99$^{ab}$ | 122$^{ab}$ |
| 39 | Dimethyl Sulfide | ether | **LT 23.77****<br>**Sit 5.34***<br>LT × Sit 1.40$^{NS}$ | 29866633 | 54386837 | 3926181 | 11857751 |

#Statistical analysis: two-way ANOVA with 4-9 replications (LT: leaf type; Sit: sites; LT × Sit: Leaf type × Sites interaction); *0.05 > $p$ < 0.01; **0.01 > $p$ < 0.001; ***0.001 > $p$; NS: not significant.

**Table S2 – *F* statistic and *p* values (within brackets) of one-way ANOVA of the leaf-level photosynthetic parameters of *Salvia ceratophylloides* measured in 2016 and 2017.**

| Parameters | Statistics |
|---|---|
| $I_{comp}$ [μmol(photon) $m^{-2}$ $s^{-1}$] | 0.406 (0.530) |
| $I_{max}$ [μmol(photon) $m^{-2}$ $s^{-1}$] | 1.076 (0.311) |
| $I_{sat}$ [μmol(photon) $m^{-2}$ $s^{-1}$] | **5.263 (0.032)** |
| $P_{N(Imax)}$ [μmol($CO_2$) $m^{-2}$ $s^{-1}$] | 3.115 (0.091) |
| $R_D$ [μmol($CO_2$) $m^{-2}$ $s^{-1}$] | 3.808 (0.064) |
| $\phi_{(Icomp-200)}$ [μmol($CO_2$) μmol(photon) $^{-1}$] | **4.561 (0.044)** |