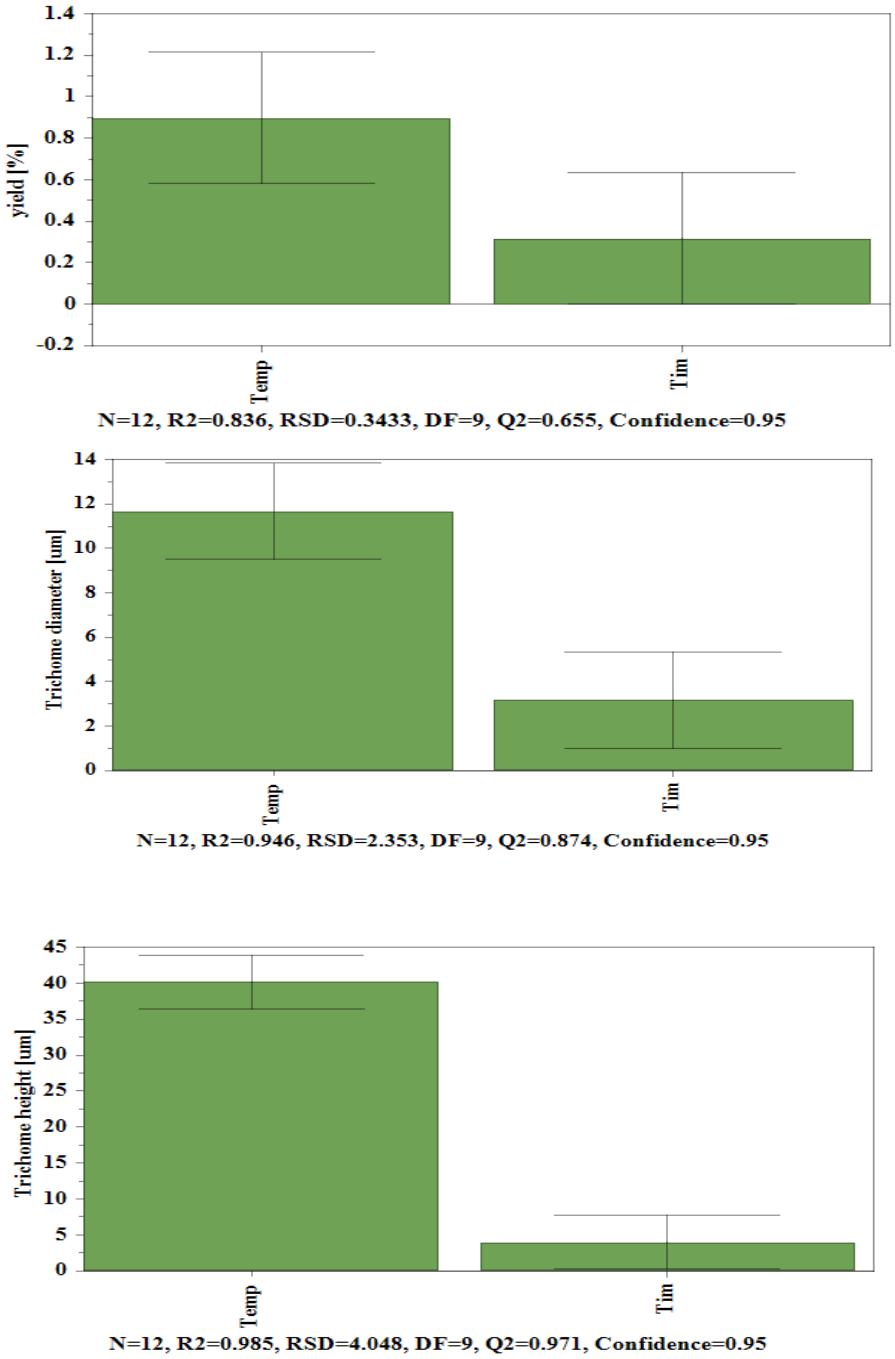
SUPPLEMENTARY MATERIAL TO:

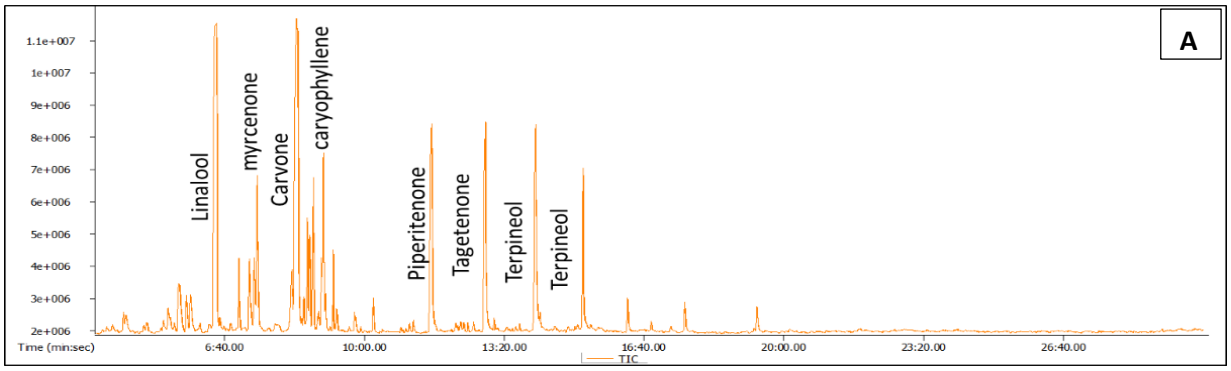
Singini et al. S Afr J Sci. 2023;119(1/2), Art. #13090

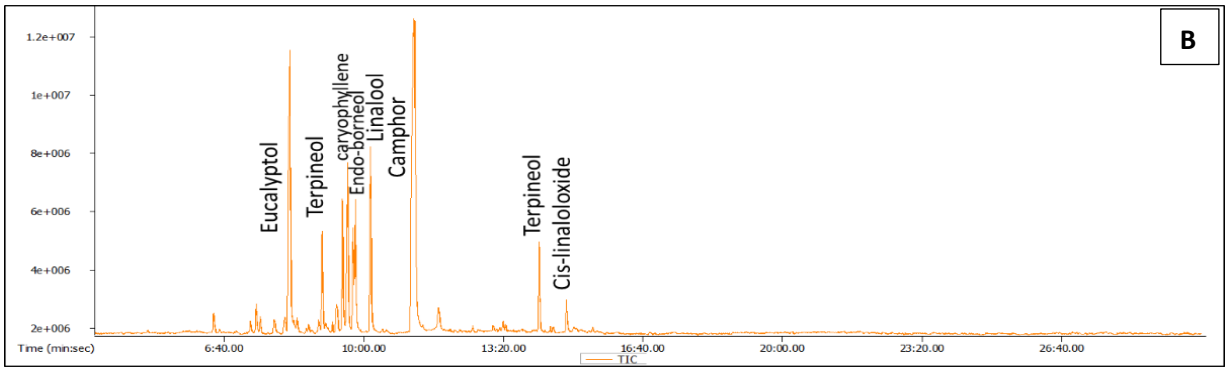
HOW TO CITE:

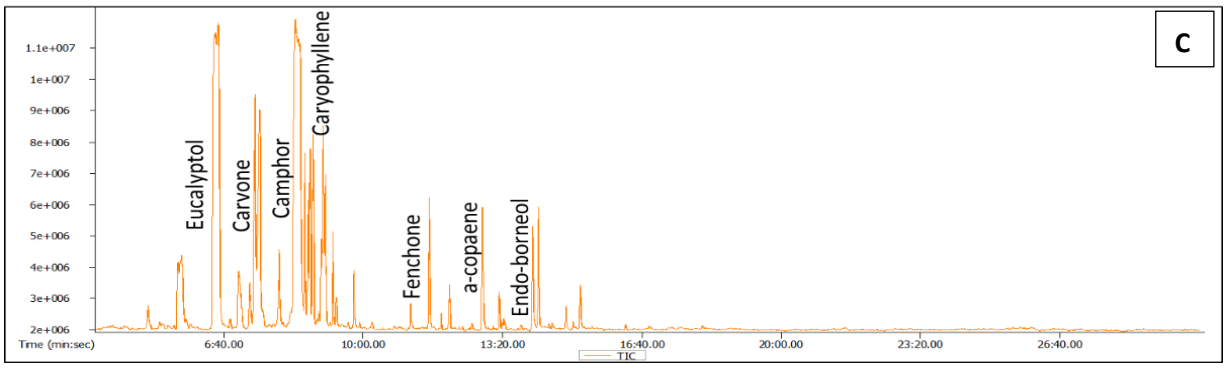
Singini EJ, Nuapia Y, Chimuka L, Risenga IM.
The effect of elevated temperatures on trichomes, essential oil composition and yield of *Lippia javanica* : A chemometric approach [supplementary material].
S Afr J Sci. 2023;119(1/2), Art. #13090.
https://doi.org/10.17159/sajs.2023/13090/suppl

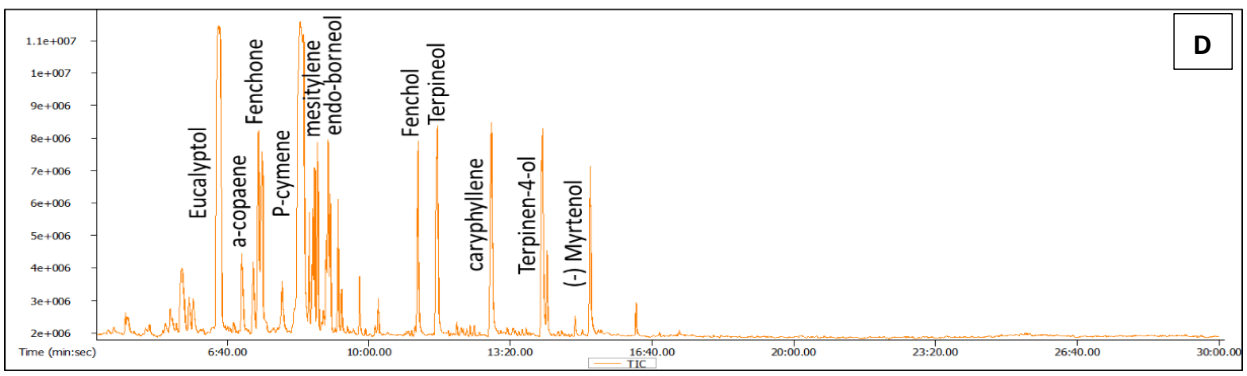


Supplementary figure 1: Coefficient plots for yield, trichome diameter and trichome height of *Lippia javanica* .

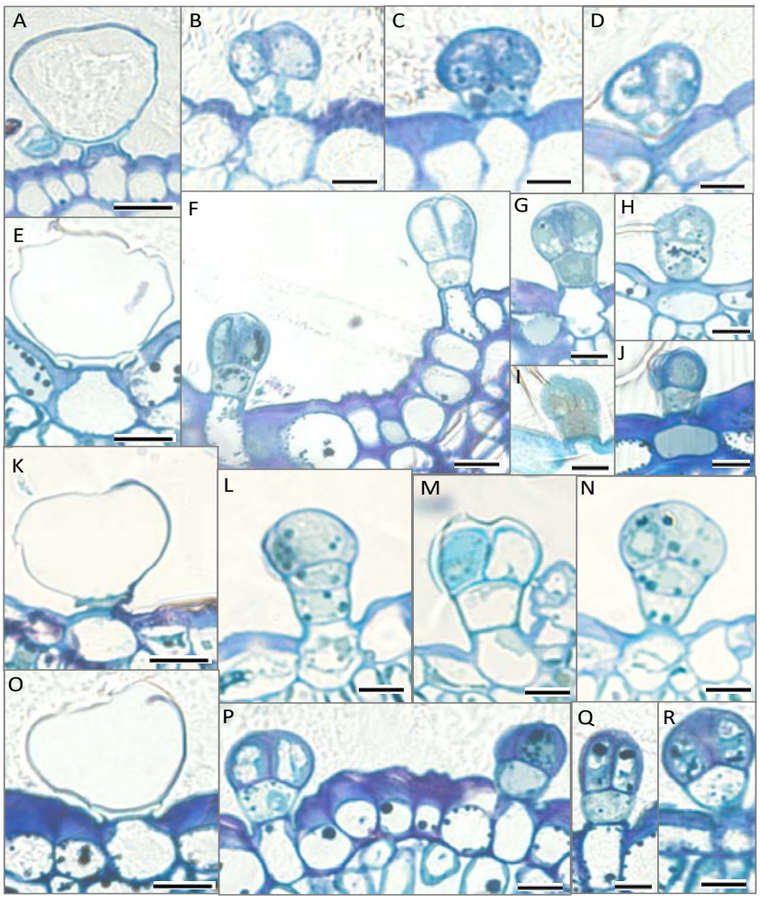








Supplementary figure 2: GC-MS chromatogram of essential oils extracted from the leaves of *Lippia javanica* at 25 °C (A – control) and 47 °C (B – 48 h, C – 96 h and D – 144 h).



Scale bars = 20 µm

Supplementary figure 3: Glandular trichomes found in *Lippia javanica* under ambient temperatures (A–D) and high temperatures (47 °C) after 48 h (E–J), 96 h (K–N) and 144 h (O–R). Glandular trichomes of the control and treated plants were classified into peltate (A, E, K, O) and capitate trichomes, which were further divided into short (B–D, H–J, R) and long (F–G, L–N, P–Q) capitate trichomes.[1,2] Capitate trichomes were more abundant than peltate trichomes and were mostly distributed on the adaxial leaf surface. Peltate trichomes, on the other hand, were characterised by larger sizes, which had short stalks made up of one cell and large spherical-shaped heads (80–130 µm in diameter), which generally had a uniform morphology (A, E, K, O). In contrast, capitate trichomes had a variety of stalk lengths and rounded pear-shaped heads (40–60 µm in diameter) made up of one or two cells.

References

1. Ascensão L, Mota L, De M. Castro M. Glandular trichomes on the leaves and flowers of *Plectranthus ornatus* : Morphology, distribution and histochemistry. Ann Bot. 1999;84(4):437–447. https://doi.org/10.1006/anbo.1999.0937

2. Martínez-Natarén DA, Parra-Tabla V, Dzib G, Calvo-Irabién LM. Morphology and density of glandular trichomes in populations of Mexican oregano (*Lippia graveolens* HBK, Verbenaceae), and the relationship between trichome density and climate. J Torrey Bot Soc. 2011;138(2):134–144. https://doi.org/10.3159/TORREY-D-10-00007.1

Supplementary table 1:

Components	Control (%)	Control (%)	Control (%)	Control (%)	Control (%)	47°C/48 hours (%)	47°C/48 hours (%)	47°C/48 hours (%)	47°C/48 hours (%)	47°C/48 hours (%)	47°C/96 hours (%)	47°C/96 hours (%)	47°C/96 hours (%)	47°C/96 hours (%)	47°C/96 hours (%)	47°C/144 hours (%)	47°C/144 hours (%)	47°C/144 hours (%)	47°C/144 hours (%)
Terineol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.15	1.173	1.12608	1.288
Terpinen-4-ol	1.56	1.4508	0.972036	0.5346198	0.368887662	1.37	1.3426	1.298	1.325	1.233	0.310	0.273	0.289	0.278	0.276	4.290	4.376	4.201	4.805
Terpineol	4.27	3.2025	2.145675	1.18012125	4.354647413	5.77	5.6546	5.468	5.581	5.195	3.540	3.115	3.302	3.170	3.146	2.830	2.887	2.771	3.170
Thymol	0.17	0.1751	0.117317	0.06452435	0.044521802	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.102	0.098	0.112
trans-Carveol	0.34	0.4182	0.280194	0.1541067	0.106333623	0	0	0.000	0.000	0.000	2.290	2.015	2.136	2.051	2.035	0.380	0.388	0.372	0.426
1-octen-3-ol	0	0	0	0	0	1.64	1.6072	1.554	1.586	1.476	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4-Heptyn-3-ol	0	0	0	0	0	0.55	0.539	0.521	0.532	0.495	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Isopinocarveol	1.53	1.0557	0.707319	0.38902545	0.268427561	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Linalool	33.11	37.4143	47.516161	49.89196905	32.1167	10.43	10.2214	9.884	10.089	9.390	3.710	4.526	4.798	4.606	4.571	0.830	0.847	0.813	0.930
Myrtenol	0	0	0	0	0	0.5	0.49	0.474	0.484	0.450	0.280	0.246	0.261	0.251	0.249	0.000	0.000	0.000	0.000
Nerolidol	0	0	0	0	0	0	0	0.000	0.000	0.000	0.060	0.053	0.056	0.054	0.053	0.000	0.000	0.000	0.000
a-Thujenal	0.54	0.4482	0.300294	0.1651617	0.163510083	0	0	0.000	0.000	0.000	0.370	0.326	0.345	0.331	0.329	0.000	0.000	0.000	0.000
Geraniol	0	0	0	0	0	0	0	0.000	0.000	0.000	0.680	0.598	0.634	0.609	0.604	0.050	0.051	0.049	0.056
Lilac aldehydeB	0.12	0.1236	0.082812	0.0455466	0.031427154	0	0	0.000	0.000	0.000	0.030	0.026	0.028	0.027	0.027	0.050	0.051	0.049	0.056
(-)-Carvone	24.53	19.3787	22.673079	21.53942505	29.93980082	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.570	0.581	0.558	0.638
Tagetenone	5.16	4.2828	2.869476	2.7260022	5.424744378	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Camphor	0.53	0.5459	0.365753	0.20116415	0.138803264	42.97	42.1106	40.721	41.563	38.685	15.710	15.396	16.320	15.667	15.550	0.790	0.806	0.774	0.885
Carvone	0	0	0	0	0	0	0	0.000	0.000	0.000	12.400	10.912	11.567	11.104	11.021	0.000	0.000	0.000	0.000
Fenchone	1.23	1.2669	0.848823	0.46685265	0.788980979	1.44	1.4112	1.365	1.393	1.296	9.660	10.433	11.059	10.616	10.537	1.460	1.489	1.430	1.635
Isophorone	0	0	0	0	0	0	0	0.000	0.000	0.000	0.010	0.009	0.009	0.009	0.009	0.100	0.102	0.098	0.112
Myrcenone	3.23	3.3269	2.229023	1.89466955	1.30732199	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pinocarvone	0.3	0.309	0.20703	0.1138665	0.078567885	0	0	0.000	0.000	0.000	1.150	1.012	1.073	1.030	1.022	0.640	0.653	0.627	0.717
Piperitenone	6.68	6.8804	4.609868	3.9183878	2.703687582	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bornyl acetate	0	0	0	0	0	0	0	0.000	0.000	0.000	0.090	0.079	0.084	0.081	0.080	0.420	0.428	0.411	0.470
Caryophyllene -oxide	0	0	0	0	0	0	0	0.000	0.000	0.000	1.060	0.933	0.989	0.949	0.942	0.520	0.530	0.509	0.582
cis-Linaloloxide	2.36	2.0768	1.391456	0.7653008	0.528057552	3.96	3.8808	3.753	3.830	3.565	2.030	1.786	1.894	1.818	1.804	1.840	1.877	1.802	2.061
Eucalyptol	0	0	0	0	0	10.86	10.6428	10.292	10.504	9.777	20.410	17.961	19.038	18.277	18.140	34.100	34.782	33.391	38.192
Longipinene -epoxide	0.31	0.3193	0.213931	0.11766205	0.081186815	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.560	0.571	0.548	0.627
(-)-Aristolene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.140	0.123	0.131	0.125	0.124	0.280	0.286	0.274	0.314
á-Copaene	0	0	0	0	0	0	0	0.000	0.000	0.000	3.400	2.992	3.172	3.045	3.022	0.050	0.051	0.049	0.056
á-Myrcene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.150	0.132	0.140	0.134	0.133	0.000	0.000	0.000	0.000
à-Phellandrene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.210	0.185	0.196	0.188	0.187	0.370	0.377	0.362	0.414
a-Pinene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.400	0.352	0.373	0.358	0.356	0.860	0.877	0.842	0.963
Camphene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.120	0.106	0.112	0.107	0.107	0.000	0.000	0.000	0.000
Caryophyllene	4.3	4.429	2.96743	2.8190585	10.40232587	10	9.8	9.477	9.673	9.003	9.310	8.193	8.684	8.337	8.275	10.160	10.363	9.949	11.379
cis-Calaminene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.090	0.079	0.084	0.081	0.080	0.090	0.092	0.088	0.101
Mesitylene	1.33	1.3699	0.917833	0.50480815	0.348317624	0	0	0.000	0.000	0.000	0.070	0.062	0.065	0.063	0.062	1.580	1.612	1.547	1.770
o-Cymene	0.28	0.2884	0.193228	0.1062754	0.073330026	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.160	0.163	0.157	0.179
p-Cymene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.790	16.106	15.462	12.316
Pentadecane	0.32	0.3296	0.220832	0.1214576	0.083805744	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.180	0.184	0.176	0.202
R-Limonene	0	0	0	0	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.300	1.326	1.273	1.456
Styrene	0.54	0.5562	0.372654	0.2049597	0.141422193	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(-)-Myrtenol	2.81	2.8943	1.939181	2.61789435	7.042135802	0	0	0.000	0.000	0.000	2.380	2.332	2.472	2.373	2.356	3.830	3.907	3.750	4.290
(-)-trans-Isopiperitenol	0.54	0.5562	0.372654	0.2049597	0.141422193	0	0	0.000	0.000	0.000	0.290	0.255	0.271	0.260	0.258	0.480	0.490	0.470	0.538
.tau.-Cadinol	0	0	0	0	0	0	0	0.000	0.000	0.000	0.390	0.343	0.364	0.349	0.347	0.180	0.184	0.176	0.202
à-Cadinol	0	0	0	0	0	0	0	0.000	0.000	0.000	0.390	0.343	0.364	0.349	0.347	0.570	0.581	0.558	0.638
cis-Verbanol	1.4	1.442	0.96614	0.531377	0.89802713	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
endo-Borneol	0	0	0	0	0	3.45	3.381	3.269	3.337	3.106	3.710	3.265	3.461	3.322	3.297	2.350	2.397	2.301	2.632
Fenchol	0.21	0.2163	0.144921	0.07970655	0.05499752	4	3.92	3.791	3.869	3.601	2.210	1.945	2.061	1.979	1.964	3.850	3.927	3.770	4.312
Isoborneol	0.26	0.2678	0.179426	0.1704547	0.117613743	0	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	97.96	95.0248	95.804546	91.5293573	97.7490044	96.94	95.0012	91.866	93.766	87.273	97.050	90.406	95.831	91.998	91.310	92.760	94.615	90.831	98.523