

Supporting Information

Quorum sensing inhibition by South African medicinal plants species: An *in vitro* and an untargeted metabolomics study

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Table S1.1: Plants species selected for *in vitro* antiquorum sensing activity screening.

Plant species (Family)	Voucher number (Herbarium)	Part	Local name*	Traditional use*
<i>Solanum aculeastrum</i> Dunal. (Solanaceae)	DS03080	L	Murulwa (Venda), Umthuma, itunga (Xhosa) and thola (Tswana).	Used for the treatment of different human and animal ailments [1].
<i>Terminalia phanerophlebia</i> Engl. & Diels. (Combretaceae)	JM00243	L	AmaNgwe-amnyama, amaNgwe-omphofu (Zulu) and mambonjwane (Swati).	Used for the treatment of many diseases including pneumonia [1].
<i>Momordica cardiospermoides</i> Klotzsch. (Cucurbitaceae)	HV00555	WP	Inshubaba (Swati) and ntwe (Tswana).	Used traditionally for the treatment of different diseases [2, 3].
<i>Burchellia bubalina</i> (L.f.) Sims. (Rubiaceae)	BP00936	L	Thobankomo (Xhosa), Golwane (Zulu) and Hlosana (Swati).	The plant is widely used in folk medicine [4-6] and ethnoveterinary including for the treatment of heart water [7].
<i>Catha edulis</i> (Vahl) Endl. (Celastraceae)	PRU 121392	L	Umhlwazi (Zulu), iqgwaka (Xhosa), lehlatse, lewang, and molomomonate (Sepedi) [8].	It is used for the treatment of common cold and respiratory of disorders [9] including tuberculosis [8] amongst others.
<i>Senegalia burkei</i> (Benth.) Kyal. & Boatwr. (Fabaceae)	JM00311	L	Umkhaya wehlahlathi, umbabampala (Zulu), umkhaya (Swati), mogwa (Tswana), and munanga (Venda).	Used to treat eye and back pain [10].
<i>Hedychium flavescens</i> Carey ex Roscoe. (Zingiberaceae)	DS02802	S	Wild ginger (English) [11].	Used for ritual purposes generally and additionally for traditional medicinal use [11, 12].
		F		
<i>Siphonochilus aethiopicus</i> (Schweinf.) B.L.Burt. (Zingiberaceae)	PRE 34817	WP	Indungulo, isiphephetho (Zulu) and African ginger (English) [13].	Used for the treatment of many disorders including tuberculosis [8], malaria, asthma, and inflammation [13, 14].
<i>Leonotis leonurus</i> (L.) R.Br. (Lamiaceae)	PRU 121393	L	Wiile dagga (Afrikaans), umfincafincane, (isiXhosa), and utshwala-bezinyoni (isiZulu).	Its widely used in traditional medicine including for influenza, epilepsy, chest infection, tuberculosis and headaches [8, 15].
<i>Salvia africana-lutea</i> L. (Lamiaceae)	FP00851	L	Ssand sage (English), bruinsalie, sandsalie, strandsalie, and geelblomsalie (Afrikaans).	Used for the treatment of tuberculosis, influenza, common cold fever amongst many other ailments [16].
<i>Salvia runcinata</i> L.f. (Lamiaceae)	JS00182	L	Isicakathi [1].	The plant is used as a disinfectant and for the treatment of hives [17], burns and sores [18].
<i>Jatropha erythropoda</i> Pax & K.Hoffm. (Euphorbiaceae)	HV00572	T	Rooikambroo (Afrikaans) ¹ and Thotamadi (Tswana and Sepedi) [19, 20].	Plant is administered as an immune booster for HIV/AIDS management [19] and other sexual transmitted diseases [20].
<i>Hypericum roeperianum</i> G.W.Schimp. ex A.Rich. (Hypericaceae)	MM00136	L	Isivumelelwane (Zulu) [1].	Used for treatment of different disorders including diarrhoea, pain, indigestion and bacterial diseases [21].
<i>Garcinia gerrardii</i> Harv. ex Sim. (Hypericaceae)	DS02273	L	Bosgeelmelkhout (Afrikaans), umbande (Xhosa), isibinda, (Zulu) and sikhwelamkhala (Swati).	Used traditionally for the treatment of tuberculosis [8].
<i>Drimia</i> sp. (Asparagaceae)	FP00938	WP		Related species used for tuberculosis treatment [8].
<i>Cyrtanthus mackenii</i> Hook.f. (Amaryllidaceae)	DS04216	L	Ifafa lily (English), and impingizana encane empofu (Zulu) [1].	Used for treatment of cough, headache, cystitis and leprosy [22].

*Data collated from PlantZAfrica (<https://pza.sanbi.org/about>) which is provided by the South African National Biodiversity Institute (<https://www.sanbi.org/>). Additional information on plants has been acquired from other sources including published peer reviewed articles. Traditional uses provided are not exhaustive.

¹<http://redlist.sanbi.org/species.php?species=576-6>. ²<https://www.inaturalist.org/> and <https://invasives.org.za/fact-sheet/brazilian-pepper-tree/> (Retrieved on the 1st of April 2024). ³<https://www.herb garden.co.za/mountainherb/herbinfo.php?id=215>.

Continued Table S1.1: Plants species selected for *in vitro* antiquorum sensing activity screening.

Plant species (Family)	Voucher number	Part	Local name*	Traditional use*
<i>Tulbaghia simmleri</i> Beauverd (Amaryllidaceae)	FP01384	R L	Sweet wild garlic, sweet garlic, fragrant tulbaghia (English), and soetwildeknoffel (Afrikaans).	Used for ornamental purposes. Related species used for tuberculosis treatment [8].
<i>Schinus terebinthifolia</i> Raddi (Anacardiaceae)	BP00904	LF	Brazilian pepper tree (English) and Brasiliaanse peperboom (Afrikaans) ² .	Used for the treatment of many disorders including gonorrhoea, tuberculosis, and bronchitis ² .
<i>Ptaeroxylon obliquum</i> (Thunb.) Radlk. (Rutaceae)	DS02499	L	Mogabaletswana (Sepedi) [8] and umThathi (Xhosa).	Used traditionally for the treatment of tuberculosis [8], fever, arthritis and rheumatism [23].
<i>Ekebergia capensis</i> Sparrm. (Meliaceae)	FP00739	L	Cape ash, dogplum (English), essenhout (Afrikaans), umnyamatsi (Swati), nyamaru (Tswana).	Used to facilitate child birth, treat headaches, and skin diseases [24].
<i>Turraea obtusifolia</i> Hochst. (Meliaceae)	PRU 129518	LF	Dima (Sepedi) [19].	Used traditionally for the treatment of tuberculosis [8].
<i>Trichilia emetica</i> Vahl (Meliaceae)	PRU121390	L	Umkhuhlu (Xhosa), nkulu (Tsonga) and mutuhu (Venda)	Traditional uses include dermatitis, digestive infections, eye infection, malaria and pneumonia [25]
<i>Arctotis stoechadifolia</i> P.J.Bergius (Asteraceae)	FP00817	L	Trailing arctotis (English), kugousblom, bittergousblom, and witgousblom (Afrikaans).	Used to "clean kidneys" [26].
<i>Eriocephalus africanus</i> var. <i>paniculatus</i> (Cass.) M.A.N.Müll., P.P.J.Herman & Kolberg (Asteraceae)	FP00896	WP	Wild rosemary (English), wilderoosmaryn, and kapokbos (Afrikaans).	Used for many diseases including coughs, cold, expectorant, and antimicrobial agent [27].
<i>Helichrysum odoratissimum</i> (L.) Sweet. (Asteraceae)	FP01629	L	Kooigoed, kruie (Afrikaans) and imphepho (Xhosa and Zulu).	Used as an incense, urinary tract infections, fever [1, 28]. Related species used for tuberculosis treatment [8].
<i>Gymnanthemum corymbosum</i> (Thunb.) H.Rob. (Asteraceae)	HV00485	L	Mountain vernonia (English) and uhlunguhlungu (Zulu).	Used to treat fever, and malaria [29].
<i>Artemisia annua</i> L. (Asteraceae) (Cultivated)		L	Sweet wormwood (English) ³ .	Used for the treatment of fever, and malaria [30].
<i>Artemisia afra</i> Jacq. ex Willd. (Asteraceae)	PRU 121389	L	African wormwood (English), wilde-als (Afrikaans), mhlonyane (isiZulu) and lengana (Tswana).	Used for tuberculosis treatment [8, 26] amongst a plethora of ailments [31].

Table S1.2: Plants species selected for *in vitro* antiquorum sensing activity screening.

Plant species	Herbarium	Name of collectors	Collection Site GPS Coordinates
<i>S. aculeastrum</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Schuhardt, D	31,37,642S;29,29,779E
<i>T. phanerophlebia</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Male, JM	24,31,994S;30,47,316E
<i>M. cardiospermoides</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Vahrmeijer, H	27,24,82S;32,6,39E
<i>B. bubalina</i>	South African National Biodiversity Institute, National Herbarium, South Africa	SANBI*	28,57,455S;31,45,592E
<i>C. edulis</i>	H.G.W.J. Schweickerdt Herbarium of the University of Pretoria, South Africa	Moyo, P, Awandu SS, and Andayi, A	-25.625S;28.125E
<i>S. burkei</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Male, JM	24,48,64S;30,48,263E
<i>H. flavescens</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Schuhardt, D	31,36,304S;29,28,584E
<i>S. aethiopicus</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Van Warmelo, NJ	23°0'0"S 29°52'0"E
<i>L. leonurus</i>	H.G.W.J. Schweickerdt Herbarium of the University of Pretoria, South Africa	Moyo, P, Awandu SS, and Andayi, A	-25.625S;28.125E
<i>S. africana-lutea</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	33,58,202S;25,13,359E
<i>S. runcinata</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Spies, JD	28,41,291S;28,18,88E
<i>J. erythropoda</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Vahrmeijer, H	26,49,44S;20,38,41E
<i>H. roeperianum</i>	South African National Biodiversity Institute, National Herbarium, South Africa	McMahon, M and Spies, C	24,49,299S;30,49,450E
<i>G. gerrardii</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Schuhardt, D	31,35,868S;29,32,8E
<i>Drimia sp.</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	33,56,699S;25,19,425E
<i>C. mackenii</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Schuhardt, D	31,35,290S;29,31,4E
<i>T. simmleri</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	33,58,208S;25,36,195E
<i>S. terebinthifolia</i>	South African National Biodiversity Institute, National Herbarium, South Africa	SANBI*	29,31,306S;31,12,82E
<i>P. obliquum</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Schuhardt, D	31,35,990S;29,29,717E
<i>E. capensis</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	33,54,311S;25,13,43E
<i>T. obtusifolia</i>	H.G.W.J. Schweickerdt Herbarium of the University of Pretoria, South Africa	Moyo, P, Awandu SS, and Andayi, A	-25.625S;28.125E
<i>T. emetica</i>	H.G.W.J. Schweickerdt Herbarium of the University of Pretoria, South Africa	Moyo, P, Awandu SS, and Andayi, A	-25.625S;28.125E
<i>A. stoechadifolia</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	32,14,5S;24,32,5E
<i>E. africanus</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	33,58,125S;25,13,452E
<i>H. odoratissimum</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Potgieter, FJ	33,58,716S;24,14,920E
<i>G. corymbosum</i>	South African National Biodiversity Institute, National Herbarium, South Africa	Vahrmeijer, H	27,22,46S;31,59,72E
<i>A. afra</i>	H.G.W.J. Schweickerdt Herbarium of the University of Pretoria, South Africa	Moyo, P, Awandu SS, and Andayi, A	-25.625S;28.125E

*SANBI – the collectors were staff members of the South African National Biodiversity Institute. Their names have not been specified. Plant material collected and deposited at the H.G.W.J. Schweickerdt Herbarium of the University of Pretoria, South Africa was identified by Mr. J. Sampson Sampson (Curator at Manie van der Schijff Botanical Garden at the University of Pretoria).

Table S2: Antimicrobial activity of crude plant extracts and their corresponding solid phase generated fractions against *C. violaceum*.

Plant species	Part	MIC and MQSIC values (mg/mL)															
		F1		F2		F3		F4		F5		F6		F7		Extract	
		MIC	MQSIC	MIC	MQSIC	MIC	MQSIC	MIC	MQSIC	MIC	MQSIC	MIC	MQSIC	MIC	MQSIC	MIC	MQSIC
<i>S. aculeastrum</i>	L	2.50	2.50	2.50	1.25	2.50	1.25	2.50	1.25	2.50	1.25	>2.50	0.63	2.50	1.25	2.5	1.25
<i>T. phanerophlebia</i>	L	2.50	1.25	0.63	0.078	1.25	0.16	0.31	0.16	0.63	0.31	0.63	0.078	>2.50	0.63	1.25	0.63
<i>M. cardiospermoides</i>	WP	2.50	2.50	2.50	2.50	2.50	2.50	1.25	1.25	2.50	1.25	>2.50	1.25	>2.50	1.25	>2.50	1.25
<i>B. bubalina</i>	L	1.25	1.25	1.25	1.25	0.63	0.31	1.25	0.63	1.25	0.63	0.63	0.31	>2.50	0.63	>2.50	0.63
<i>C. edulis</i>	L	1.25	1.25	1.25	1.25	>2.50	0.63	1.25	0.31	0.63	0.31	0.63	0.31	0.63	0.31	1.25	0.31
<i>S. burkei</i>	L	2.50	2.50	1.25	1.25	0.63	0.31	1.25	0.63	0.63	0.63	>2.50	0.63	>2.5	0.63	1.25	1.25
<i>H. flavescens</i>	F	2.50	1.25	2.50	1.25	1.25	1.25	1.25	1.25	2.50	0.63	>2.50	1.25	>2.5	1.25	>2.5	1.25
<i>S. aethiopicus</i>	WP	2.50	1.25	2.50	1.25	1.25	1.25	1.25	1.25	>2.50	1.25	>2.50	0.63	>2.50	0.63	>2.50	0.63
<i>L. leonurus</i>	L	1.25	1.25	>2.50	1.25	>2.50	1.25	1.25	1.25	>2.50	0.63	>2.50	0.63	>2.5	1.25	2.5	1.25
<i>S. africana-lutea</i>	L	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	>2.50	1.25	>2.50	0.63	1.25	1.25	1.25	1.25
<i>S. runcinata</i>	L	2.50	2.50	2.50	1.25	2.50	1.25	2.50	2.50	1.25	1.25	>2.50	0.31	1.25	0.63	>2.50	1.25
<i>J. erythropoda</i>	T	1.25	1.25	1.25	1.25	>2.50	0.63	2.50	0.63	2.50	0.63	>2.50	0.31	2.50	0.63	1.25	1.25
<i>H. roeperianum</i>	L	1.25	1.25	1.25	1.25	2.50	0.63	0.63	0.63	1.25	0.31	>2.5	0.63	1.25	0.63	1.25	1.25
<i>G. gerrardii</i>	L	2.50	1.25	2.50	1.25	2.50	1.25	2.50	2.50	1.25	0.63	2.50	0.63	>2.50	1.25	>2.50	1.25
<i>Drimia sp</i>	WP	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	>2.50	0.63	>2.50	1.25	>2.50	1.25
<i>C. maackenii</i>	L	2.50	1.25	2.50	2.50	1.25	1.25	1.25	1.25	1.25	1.25	>2.50	0.63	2.50	1.25	>2.50	1.25
<i>T. simmleri</i>	R	1.25	1.25	1.25	0.63	0.63	0.31	0.63	0.31	>2.50	0.63	>2.50	0.63	>2.50	1.25	>2.50	1.25
<i>T. simmleri</i>	L	2.50	1.25	1.25	1.25	1.25	1.25	2.50	2.50	>2.50	0.63	>2.50	0.31	>2.5	0.63	>2.5	1.25
<i>S. terebinthifolia</i>	LF	2.50	2.50	>2.50	1.25	>2.50	1.25	1.25	1.25	>2.50	1.25	>2.50	1.25	>2.50	1.25	>2.50	1.25
<i>P. obliquum</i>	L	2.50	1.25	2.50	2.50	2.50	2.50	2.50	2.50	>2.50	0.63	>2.50	0.31	>2.50	0.63	>2.50	0.63
<i>E. capensis</i>	L	2.50	2.50	2.50	2.50	2.50	1.25	0.63	0.63	1.25	1.25	>2.50	0.63	>2.50	1.25	>2.50	1.25
<i>T. obtusifolia</i>	LF	2.50	1.25	2.50	2.50	2.50	1.25	2.50	1.25	>2.50	1.25	>2.50	0.63	2.50	0.63	>2.50	1.25
<i>T. emetica</i>	L	2.50	1.25	2.50	1.25	2.50	1.25	2.50	1.25	2.50	1.25	>2.50	1.25	>2.50	0.63	>2.50	1.25
<i>A. stoechadifolia</i>	L	2.50	2.50	2.50	2.50	2.50	2.50	1.25	1.25	1.25	1.25	>2.50	0.63	>2.50	1.25	>2.50	1.25
<i>E. africanus</i>	WP	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	>2.50	0.63	>2.50	0.63	>2.50	1.25	>2.50	1.25
<i>H. odoratissimum</i>	L	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	0.63	0.31	2.50	0.31	>2.50	0.31	>2.50	0.63
<i>G. corymbosum</i>	L	2.50	2.50	2.50	2.50	2.50	2.50	2.50	1.25	0.63	0.63	>2.50	0.31	0.63	0.63	1.25	1.25
<i>A. annua</i>	L	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	0.63	0.63	>2.50	0.31	>2.50	1.25	1.25	1.25
<i>A. afra</i>	L	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	0.63	0.63	>2.50	0.63	1.25	1.25	1.25	1.25

MIC – minimal inhibition concentration and MQSIC – minimal quorum sense inhibition concentration. *n* = 1.

Supplementary Files F1 to F5 used for the tentative annotation of compounds from *Terminalia phanerophlebia* using MassLynx.

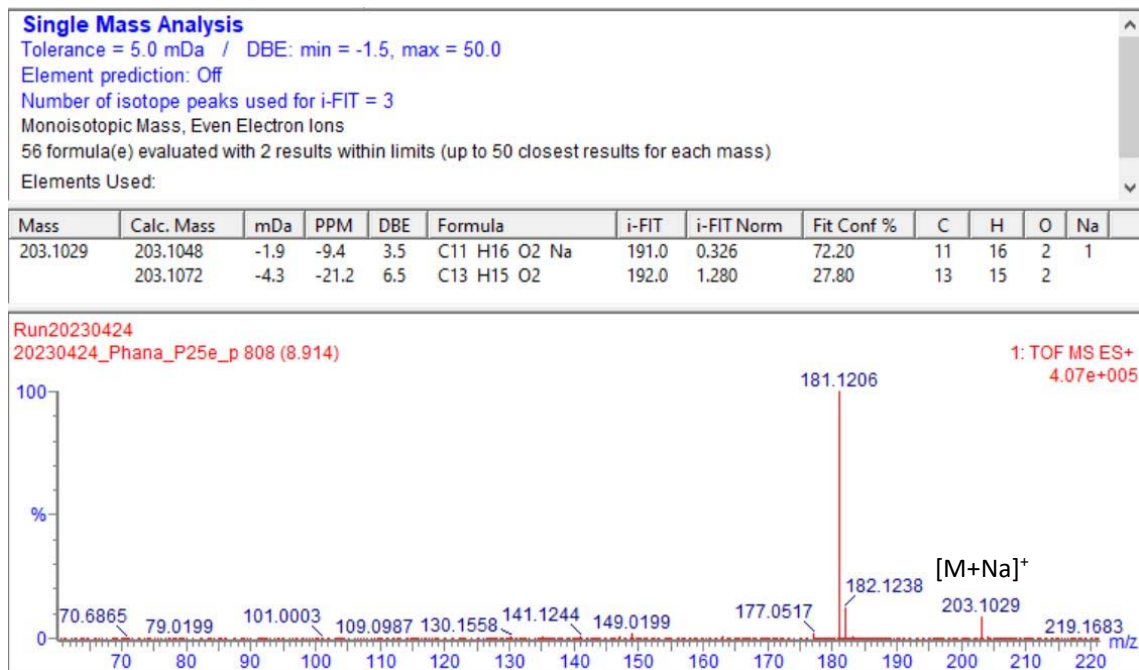


Figure F1: Annotation for compound 1 on MassLynx

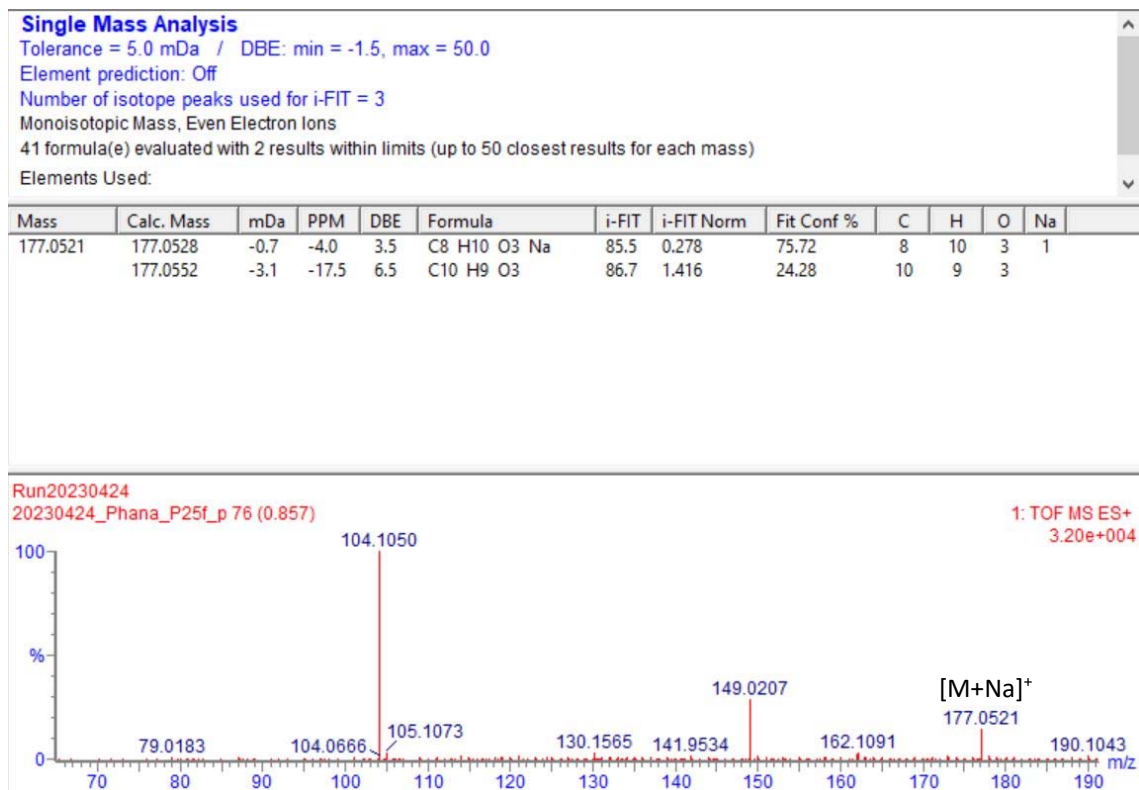


Figure F2: Annotation for compound 2 on MassLynx

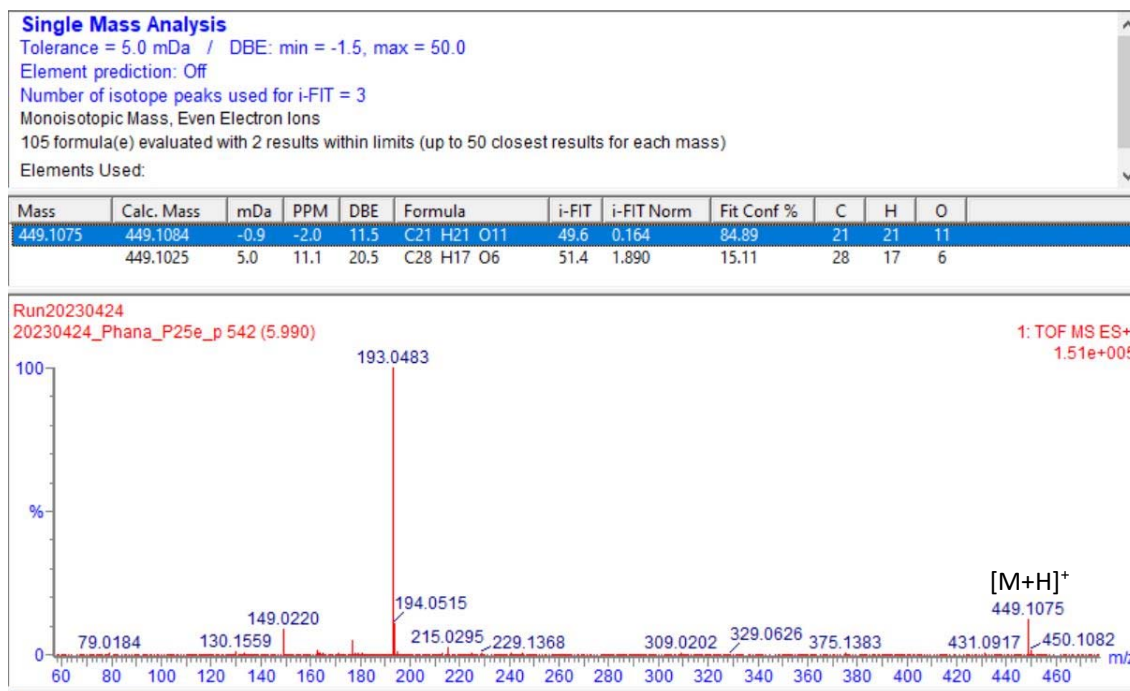


Figure F3: Annotation for compound 3 on MassLynx

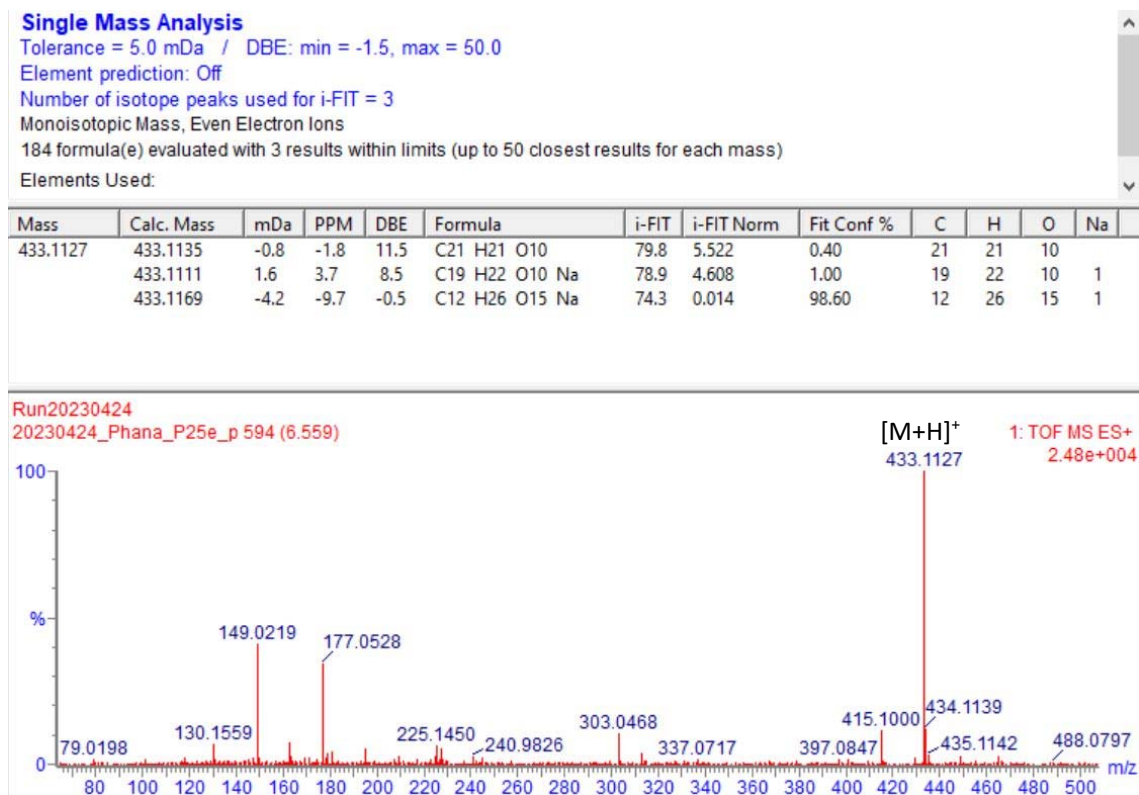


Figure F4: Annotation for compound 4 on MassLynx

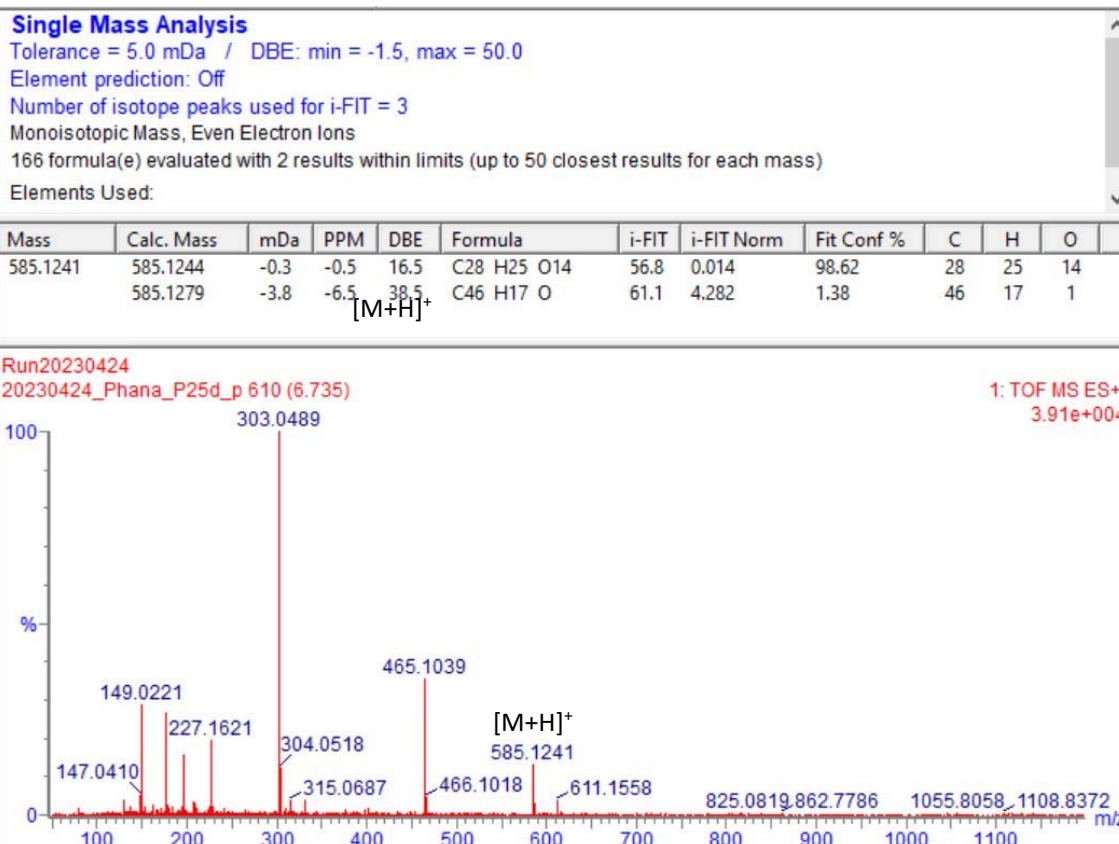


Figure F5: Annotation for compound **5** on MassLynx

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