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LC-ESI-MS/GC-MS Based Metabolite Profiling of Chlorophytum comosum (Thunb.) Jaques and evaluation of its antioxidant and antiproliferative effects on lung and breast cancer cell lines

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LC-ESI-MS/GC-MS Based Metabolite Profiling of *Chlorophytum comosum* (Thunb.) Jaques and evaluation of its antioxidant and antiproliferative effects on lung and breast cancer cell lines

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26 **LC-ESI-MS/GC-MS Based Metabolite Profiling of *Chlorophytum comosum***
27 **(Thunb.) Jaques and evaluation of its antioxidant and antiproliferative effects on**
28 **lung and breast cancer cell lines**

29 **Abstract**

30 **Background** *Chlorophytum comosum* popularly known as Spider Ivy is an important
31 medicinal plant in traditional Chinese medicine utilized in the treatment of many
32 ailments, however its detailed chemical composition and biological activity is not much
33 explored. The present study aims to identify different chemical constituents present in
34 roots and leaves of *Chlorophytum comosum* and investigates its antioxidant,
35 antiproliferative and haemolytic effects on breast (MCF-7) and lung cancer cell lines
36 (A549, H1299) as compared to normal lung (L-132) cell lines.

37 **Methods** Chemical constituents from aqueous roots and leaves extracts were identified
38 using LC-ESI-MS/GC-MS. The identified compounds were annotated based on match of
39 mass spectral database with the literature using NIST 14 and METLIN databases.
40 Antioxidant activity was checked using DPPH, FRAP and TPC assays. The
41 antiproliferative effects of ethanolic roots and leaf extracts of *Chlorophytum comosum*
42 were measured by MTT assay on breast (MCF-7), lung cancer (A549 & H1299) and
43 normal lung (L-132) cell lines. The toxicity studies of the extracts were carried out using
44 Haemolytic assay.

45 **Results** GC-MS analysis identified 34 new metabolites in roots and 17 from leaves, while
46 as 17 compounds from roots and 7 from leaves were detected by LC-ESI-MS. Significant
47 antiproliferative effects were observed on MCF-7 & A549 cell lines with IC_{50} values
48 ranging from 31.94 µg/ml to 77.84 µg/ml while no marked response was observed against
49 normal cell line. Haemolysis studies revealed no significant toxicity of the extracts
50 towards the biological system.

51 **Conclusion** Our study is the first preliminary report on the detailed chemical composition
52 and antiproliferative potential of *Chlorophytum comosum,* indicating significant specific
53 antiproliferative activities against lung (A549) and breast (MCF-7) cancer cell lines.
54 However, further studies are required to understand the mechanism involved in cytotoxic
55 properties of *Chlorophytum comosum*.

56 **Keywords:** GC-MS, LC-ESI-MS, *Chlorophytum comosum*, A549, MCF-7,
57 Phytochemicals, Cytotoxicity.

58 **Background**

59 *Chlorophytum comosum* (Thunb.) Jacques commonly known as Spider Ivy belongs to
60 family *Lilliaceae* and genus *Chlorophytum.* It is a popular ornamental plant and is
61 considered to be an excellent air purifier and air detoxifier [1-2]. In traditional Chinese
62 medicine, it is used for the treatment of respiratory ailments such as Bronchitis, Asthma
63 [3-4], Fractures and Burns [3]. Saponins isolated from roots of *Chlorophytum comosum*
64 have been found to exhibit cytotoxic and antitumour promoter activity in selected cancer
65 cell lines [5-6].However the detailed information on plant phyto-composition is still
66 lacking. Despite having the ethnobotanical background validated by previous findings,
67 not many efforts have been taken to explore this plant for its therapeutic active
68 constituents. In this study we reported for the first time the comparative and
69 comprehensive chemical profiling of *Chlorophytum comosum* through GC/MS, LC-ESI-
70 MS method and evaluated their antioxidant and antiproliferative potential using *in vitro*
71 assays. The newer compounds identified were matched using mass spectral database
72 search by NIST and METLIN [7] .The antiproliferative activity of ethanolic roots
73 (CCRE) and leaf (CCLE) extracts were checked by MTT assay on breast (MCF-7) and
74 lung (A549 & H1299) and normal lung cell line (L-132).

75

76 **Methods**

77 **Plant Material**

78 Plant material was obtained from the herbal garden of Jamia Hamdard. The harvested
79 roots and leaves were fully mature, healthy and free from disease. The plant samples were
80 identified by the botanist Dr. Sunita Garg (NISCAIR, New Delhi) and the voucher
81 specimens bearing no. NISCAIR/RHMD/CONSULT/ 2016/2975-02 were deposited in
82 the herbarium.

83 **Chemicals and Reagents**

84 All the solvents used for the study i.e. Methanol, n-Butanol, Petroleum Ether, Water,
85 Formic Acid, Acetonitrile were of HPLC/LC-MS grade and were purchased from Merck
86 (Darmstadt, Germany). Ethanol and chemicals (DPPH, TPTZ, L- Ascorbic acid, $FeCl_3$,
87 and Na_2CO_3) were of the highest purity and were purchased from the local commercial
88 supplies. Cell culture media DMEM with phenol red (#1932403), Fetal Bovine Serum (#
89 10438034), Trypsin –EDTA solution with phenol red (#1897336) and antibiotic solution
90 PenStrep (#192493) were purchased from Gibco USA. MTT reagent (#MICB8173V),
91 Standard Vinblastine, Folin Ciocalteau reagent were obtained from Sigma Aldrich USA.
92 Hydrogen peroxide, Gallic acid and DMSO were purchased from Thomas Baker India. All
93 the cell lines used in the study were procured from ATCC (USA).

94 **Preparation of Plant Extracts**

95 *Chlorophytum comosum* leaves aqueous (CCLA), ethanolic (CCLE) and *Chlorophytum*
96 *comosum* roots aqueous (CCRA), ethanolic fractions (CCRE) were prepared using soxhlet
97 extraction method. Briefly, the plant materials were washed to remove debris, air-dried and
98 grinded. The grinded plant material (10gm) was defatted using petroleum ether (1:15 w/v),
99 suspended in water/ethanol (150mL) and extracted for 24 hrs at 50^0C. The extracts were
100 then collected, filtered, and processed to become colourless using n-butanol, concentrated

101 on a rotary evaporator at 55^0C and 55mbar pressure until the semi-dried substance was
102 obtained. The semi-dried substance was further lyophilized to remove the traces of solvent.
103 The samples were then stored in airtight vials at 4^0 C till further use.

104 **Gas Chromatography/Mass Spectrometry (GC-MS) Analysis**

105 To conduct the GC-MS analysis, aqueous leaf and root extracts (5 mg each) were dissolved
106 in 1 mL of methanol and filtered using 0.22-micron filter to utilize in further analytical
107 procedures. GC-MS analysis was carried out on Shimadzu GCMS QP-2010 plus system
108 using chromatographic separation column (Rtx-5 Sil MS column; 30 m×0.32 mm id
109 ×0.25µm film thickness). The operating conditions of the column included oven
110 temperature program from 80°C to 210°C at 4°C/min withhold time of 2 min and from
111 210°C to 300°C at 15°C/min withhold time of 5 min, and the final temperature was kept
112 for 20 min. The injector temperature was maintained at 270°C, the volume of injected
113 sample was 0.3 µL, pressure 85.4kPa, total flow 76.8 mL/min, column flow 1.21 mL/min,
114 linear velocity 40.5 cm/sec, purge flow 3.0 mL/min, split ratio: 60.0, ion source
115 temperature 230°C, scan mass range of m/z 40-600 and interface line temperature 280°C.
116 The peak area based on retention time was expressed as percentage composition of the
117 crude extract. The identification and characterization of compounds were performed by
118 comparing their mass spectra with data from NIST 14 (National Institute of Standards and
119 Technology, US) and WILEY 8 library.

120 **Liquid Chromatography Mass Spectrometry (LC-ESI-MS) analysis in positive ion**
121 **mode**

122 LC-MS is the high-end technology which is increasingly employed in plant analytical
123 research [7]. LC-MS enables the separation, identification and characterization of
124 phytoconstituents present in complex crude plant extracts by giving high chemical
125 specificity and sensitivity. Qualitative or quantitative estimation of known/unknown

126 compounds present in the crude mixture can be deciphered using LC-MS [7]. Briefly
127 aqueous extracts CCLA and CCRA were prepared in LCMS grade methanol and analysed
128 on QSM-LC-MS electrospray ionization (ESI) single quadrupole mass spectrometer
129 (Waters, Milford-MA) coupled with Synapt G2 using BEH C18, 1.7µm - 2.1 x 50 mm
130 column on positive ion mode (ES+) with following mobile phases: (A) 0.1% formic acid
131 (B) Acetonitrile (C) Methanol (sample input and acquisition; 5µL /min flow rate and 250
132 µL injection volume). The parameters for analysis were as follows: source temperature
133 1000^0 C, cone voltage 40 eV, capillary voltage 3 kV, desolvation temperature 3500^0 C, cone
134 gas flow 50 l/h, and desolvation gas flow 900 l/h. Mass spectra were detected in the ESI
135 positive ion mode between m/z 100–1000 with a scan time of 0.40/sec for 20 minutes.
136 Leucine Enkephalin was used as a reference material for mass spectrometer tuning and
137 calibration. The data generated by LC-ESI-MS was analysed using an open source platform
138 XCMS software combined with METLIN [8].

139 **DPPH Free Radical Scavenging Activity**

140 The free radical scavenging activity of *Chlorophytum comosum* aqueous leaf (CCLA) and
141 roots extract (CCRA) were measured following methodology given by [9] with slight
142 modifications. Briefly, 200 mmol L^{-1} of DPPH solution was prepared by dissolving 1.57g
143 of DPPH in 20 mL of methanol and was stored in dark. Different concentrations (1000
144 µg/mL-62.5 µg/mL) were prepared separately on a 96 wells microplate by serial dilution
145 (Stock conc. 100mg/mL, working conc. 1mg/mL). Blank was prepared using methanol.
146 Control was prepared by adding 200 µL of DPPH in 50 µL of water. The reaction was
147 initiated by adding 200 µL of DPPH in 50 µL of the extract of varied concentrations followed
148 by an incubation period of 60 minutes. The absorbance was recorded on ELISA microplate
149 reader at 515nm. Ascorbic acid was taken as standard and tested with the same
150 concentrations as extracts. The experiments were repeated 3 times and % DPPH free radical

151 scavenging activity of the extracts was measured using the following formula and values
152 were expressed as mean ± SD.

153 % DPPH scavenging = [(C – S) X 100] / C….. (Eq.-1)

154 C= Absorbance of control;

155 S= Absorbance of samples.

156

157 **Ferric Reducing Antioxidant Power Assay (FRAP)**

158 FRAP is an electron transfer based assay which monitors the reaction of Fe^{2+} with TPTZ to
159 form a violet-blue color from colorless oxidized Fe^{3+}. The reducing ability of the extracts
160 were measured by the method given by [10] with some modifications. Briefly different
161 concentrations of the extracts were prepared by serial dilution (1000 µg/mL to 62.5 µg/mL)
162 on 96 wells microplate (Stock conc. 100mg/mL, working conc. 1mg/mL). The standard
163 curve was prepared using Ascorbic acid. FRAP working solution was prepared by adding
164 10 volume of acetate buffer (300 mM, pH- 3.6, 20mL) with 1 volume of TPTZ (40mM
165 prepared in dil. HCL, 2mL) and 1 volume of $FeCl_3$ (20mM, 2mL) solution. The reaction
166 mixture were mixed well and stored at 37^0C. Deionized milli q water served as blank while
167 control contained FRAP solution alone. 50 µL of the extract were mixed with 240 µL of
168 FRAP solution on 96 well microplate and incubated in dark for 30 minutes. The absorbance
169 was measured at 593nm. FRAP values were obtained by comparing the absorption change
170 in test mixture (triplicate values) with the standard.

171 **Determination of Total Phenolic Contents (TPCs)**

172 Total phenolic contents of the aqueous extracts were measured as described by [9] with
173 slight modifications. Folin Ciocalteau (FC) reagent was diluted in 1:1 ratio (v/v) in double
174 distilled water (DDW). 25 µL of each sample (stock conc. 100mg/mL) was loaded on to
175 the 96 well plate and diluted 4 times by adding 75 µL of DDW. To the diluted samples,

176 25 µL of the FC reagent was added and incubated for 6 min, then 100 µL of 75 g L^{-1}

177 Na_2CO_3 was added. The solution was placed in the dark for 30 min at room temperature

178 for color development. After incubation the absorbance were taken at 765 nm. Acetone

179 served as blank. Gallic acid was used as a standard (1000 µg/mL-62.5 µg/mL) to produce

180 a calibration curve (average R^2 = 0.9990). Each sample was run in duplicate. Total

181 phenolic concentration was expressed as mg gallic acid equivalent (GAE) g^{-1} dried

182 sample.

183 **MTT Assay**

184 The antiproliferative effects of ethanolic roots (CCRE) and leaf extracts (CCRE) were

185 measured using MTT assay. The cytotoxic effect of CCLE and CCRE on MCF-7(Breast)

186 and A549, H1299 (Lung) cancer cell lines were investigated and compared against normal

187 human epithelial cell line (L-132) for the selective response. Cell lines were procured from

188 ATCC, USA and were maintained at 37^0C with 5% CO_2 in an incubator using DMEM

189 complete medium with 10% FBS and 1% antibiotic solution. Briefly, cells were seeded with

190 a cell density of 40,000 cells per well into 96 well culture plate. Cells were treated with

191 varying extract concentrations (10-320 µg/mL) for 24hrs. Vinblastine was used as positive

192 control in the study and was exposed to cells at varying concentrations from 3.12-100 µM.

193 After 24 hrs of the treatment, cells were treated with 10 µL MTT solution (0.5mg/mL) and

194 further incubated for 4 hrs, the medium was then discarded and the formazan crystals were

195 dissolved using 100 µl of DMSO solution. The absorbance was measured at 570nm using

196 Spectra max spectrophotometer. The % cell inhibition were measured by using the following

197 formula (Eq.-2). The concentration at which the test drug inhibited cell growth by 50% i.e.

198 inhibitory concentration (IC_{50}), is generated from the dose-response curves using Graph Pad

199 Prism software (8.1). The final concentration of DMSO was maintained at 0.1% in all the

200 test preparations. 1 % DMSO containing cells served as vehicle control.

201 % Cell Inhibition by CCLE /CCRE extracts = [(C – S) X 100] / C ………. (Eq.-2)

202 C= Absorbance of control; S= Absorbance of samples.

203 **Haemolysis Assay**

204 The haemolytic activity of the extracts was measured by colorimetric assay as described
205 previously by [11] at 594 nm. Briefly, 5mL of fresh human blood was collected in K_3 EDTA
206 vacutainer tubes and was centrifuged at 1000 rpm for 10 min at 4^0C. The supernatant
207 containing plasma was carefully removed and the white buffy layer was aspirated with
208 precautions and discarded into 3% hydrogen peroxide solution. The erythrocytes were then
209 washed thrice with 1X PBS, pH 7.4. Washed erythrocytes were diluted twice (1:2) with 1X
210 PBS. 50 µL of the diluted erythrocytes suspension were taken into 2 mL Eppendorf tube and
211 100 µL of ethanolic root and leaves extract of different concentrations ranging from 10
212 µg/mL-320 µg/mL were added. 100 µL of 1X PBS was used as negative control while 100
213 µL of 1% SDS served as positive control The reaction mixture was incubated at 37^0C for
214 60 min. After incubation the volume was made upto 1 mL by adding 850µL of 1X PBS.
215 Finally centrifuged at 300 rpm for 3 min and the resulting haemoglobin in supernatant was
216 measured at 540 nm by spectrophotometer to determine the concentration of haemoglobin.
217 The percent haemolytic activity of the extracts were expressed using (Eq.-3).

218 % Haemolytic activity of extract = [(C – S) X 100] / C…… (Eq.-3).

219 C= Absorbance of control;

220 S= Absorbance of samples.

221 **Statistical Analysis**

222 IC_{50} values for cytotoxicity tests were derived from nonlinear regression analysis (curve
223 fit) based on sigmoid dose-response curve (variable) and computed using Graph Pad Prism
224 8.1 (San Diego, CA, USA). The data were expressed as mean ± SD of three independent
225 experiments. Differences were considered statistically significant at $p < 0.05$.

226 **Results**

227 **Metabolite profiling of leaf and roots of *Chlorophytum comosum* by GC-MS**

228 The qualitative and quantitative analysis of the active constituents present in aqueous roots
229 and leaf extracts of *Chlorophytum comosum* were performed using GC/MS. Thirty four
230 new compounds were identified in leaf extracts (CCLA) while 17 metabolites were
231 observed in root extracts (CCRA). The identified phytoconstituents belonged to different
232 classes of phenols, triterpenes, sterols, alcohols, aldehydes, fatty acids, saponins, organic
233 acids and hydrocarbons. Significant differences in chemical composition between roots
234 and leaf extracts were observed. Phenolic compounds such as Guaiacol (1.38%), 4-
235 vinylguaiacol (1.28%), Syringol (1.08%), and 3-hydroybenzyl alcohol (7.59%) were
236 observed in the leaf extract (Table 1). On the contrary the saponins of various class such
237 as Tigogenin tosylate (4.43%), Neotigogenin (16.25%), Yuccagenone (14.05%) were
238 found as the major portion of the root part (Table 2). However, saponins like
239 Sarsasapogenin (7.54%) and Diosgenin (1.27%) were detected in leaf as well. An
240 important plant sterol β- Sitosterol was found to be present in higher amounts in roots
241 (7.79%) as compared to leaf (1.24%). Similarly, the fatty acids were also present in higher
242 amounts in roots as compared to leaves. Polysaccharides were also identified in leaf but
243 found to be absent in roots. The % content of metabolites was expressed in terms of peak
244 area depending upon retention time. Identification of the components was achieved based
245 on the retention indices match and fragmentation pattern with the database available in
246 NIST14 library.

247 **Metabolite profiling of leaf and roots of *Chlorophytum comosum* by LC-ESI-MS in**
248 **positive ion mode**

249 LC-ESI-MS analysis of CCLA and CCRA extracts led to the tentative identification of
250 compounds detected in positive ion mode using METLIN database batch search with an

251 accuracy of 10ppm. The identified compounds were annotated based on match of mass
252 spectral database with the literature and were selected from the database based on
253 possibility of availability and solubility in crude mixture. 17 metabolites were detected in
254 roots among which Purpurogallin [12], Ginsenoyne B [13], Sagecoumarin [14] Gnidicin
255 [15] possess important pharmacological functions. In leaf 7 metabolites annotated, were
256 fatty acids like Oleyl Anilide a known ACAT inhibitor [16] , 6-Bromo-5E,9Z,13Z-
257 docosatrienoic acid, 3-(2-Heptenyloxy)-2-hydroxypropyl undecanoate, 5,6-Dichloro-1,3-
258 cyclohexadiene, alkaloid Serratanidine, Salicylic acid beta-D-glucoside and Methyl (9Z)-
259 6'-oxo-6,5'-diapo-6-carotenoate. The peak pattern of metabolites separated in positive ion
260 mode [M+H] in roots and leaves are depicted in Table (3 & 4). LC-ESI-MS total
261 chromatogram is presented in (Figure 1).

262 **Antioxidant activity by *Chlorophytum comosum***

263 Antioxidants have been found to be a stabilizing factor in cancer prevention [17]. In the
264 present study the antioxidant potential of *Chlorophytum comosum* aqueous extracts
265 (CCLA & CCRA) were determined by DPPH and FRAP assay. The scavenging effects
266 were checked on 5 different concentrations (62.5-1000 µg/ml). Leaf extract exhibited
267 maximum response in both DPPH assay (IC_{50} 3.08 µg/ml) and FRAP (311.2 µg/ml) assay
268 as compared to root extracts IC_{50} 5.8 µg/ml in DPPH & 548.3 µg/ml in FRAP). %
269 scavenging of DPPH followed a dose dependent increase with slighter variation at 125
270 µg/ml, similar response were observed in FRAP assay where the absorbance indicating
271 the reducing ability of the extracts increased dose dependently (Figure 2a and 2b).

272 **Quantification of total phenolic contents (TPCs)**

273 In agreement with our GC-MS finding the total phenolic content in the leaf extract were
274 found to be higher than the root extract The total phenolic content of roots and leaf extract
275 was found to be 2.0.2 and 3.38 mg/g respectively of the gallic acid equivalent (GAE) g^{-1}

276 dried sample (Figure 2c) Each sample was run in duplicates. The standard curve was
277 calibrated using 5 different concentrations (62.5-1000 µg/ml) and the spectra was
278 recorded at 795nm.

279 **Anti-proliferative activity on breast cancer cell lines (MCF-7)**

280 The anti-proliferative potential of ethanolic leaf (CCLE) and roots (CCRE) extracts on
281 MCF-7 cancer cells versus L-132 normal cells were determined by MTT assay. Cells
282 were treated with the extracts (CCLE, CCRE) in dose dependent manner (10µg/ml-
283 320µg/ml) for 24 hours. The % cell inhibition of MCF-7 cells was observed from 8.62 %
284 to 91.2 % in roots (CCRE) while in leaves (CCLE) it was observed from 3.45 % to 88.45
285 %. The cytotoxic effect of the CCRE was higher as compared to the CCLE extract with
286 an IC_{50} value of 31.94 µg/mL, while as for the CCLE it was 57.8 µg/mL (Figure 3). Most
287 importantly at the similar doses, these extracts did not show significant reduction on the
288 viability of L-132 cells thereby suggesting that their cytotoxicity is specific towards
289 cancer cells. The IC_{50} value ranges were in accordance with NCI guidelines where the
290 suitability of a drug candidate with less than 100 µg/ml is taken into consideration.
291 Standard vinblastine exhibited the similar level of inhibitory effects with IC_{50} value of 6.9
292 µM in MCF-7 and 80.1 µM in L-132 cell lines as shown in (Figure 3).

293 **Anti-proliferative activity on lung cancer cell lines (A549 & H1299)**

294 In response to 24 hrs dose dependent treatment of ethanolic leaf and root extracts on lung
295 cancer cell lines, significant cytotoxicity with varying response on each cell line was
296 observed. In A549 cell line, dose dependent % cell inhibition was observed from 9.32 %
297 to 92.7 % (CCRE) while as, in CCLE it dropped from 8.32% to 91.7 % with an IC_{50}
298 values of 62.25 µg/mL and 77.84 µg/mL respectively. In case of H1299 no significant
299 anti-proliferative effects of roots extract was seen as the maximum % cell inhibition
300 achieved was from 4.32 % to 58.14 % while on the other hand % cell inhibitory trend of

301 9.17 % to 90.68% was observed in leaves extract. Among both the cell lines A549 cell
302 line showed maximum response with an IC_{50} value of 62.25 µg/mL (CCRE) and 77.84
303 µg/mL(CCLE) as compared to H1299 where the calculated IC_{50} values were 173.7 µg/mL
304 (CCRE) and 82.63 µg/mL (CCLE). No inhibitory response was seen on L-132.Selective
305 response of the extracts on different cancer cell lines based on IC_{50} values are depicted in
306 (Figure 3).

307 ***In vitro* haemolytic effects of *Chlorophytum comosum* on human erythrocytes**

308 The haemolysis of red blood cells (RBCs) is a major concern for the clinical development
309 of therapeutic agents [18]. Therefore to determine the safety profile, the haemolytic
310 activities of the CCRE and CCLE were also evaluated. The haemolytic activity of the
311 extracts were found to be insignificant and did not raise beyond 30% at the selected
312 concentrations however the % haemolytic activity was observed in dose dependent
313 manner. This indicates that even at maximum inhibitory concentration, the samples
314 CCLE and CCRE did not show any significant haemolytic activity on RBC's thus CCLE
315 and CCRE can be considered safe for pharmaceutical studies. Percent (%) haemolytic
316 active at different concentrations of CCRE and CCLE is depicted in (Table 5).

317 **Discussion**

318 *Chlorphytum comosum* (Thunb). Jacques (Spider Ivy) is a well-known plant for its
319 ornamental value worldwide however based on ethanopharmacological evidence it has
320 documented to be used in traditional Chinese medicine preparations for treatment of
321 respiratory ailments, fracture and burns [3-4] In India roots part of *Chlorophytum*
322 *comosum* is available under the common name of 'Safed Musli' and is believed to be
323 utilized as a substitute/ adulterant in preparation of important class of drug 'Rasayna' in
324 Ayurveda [19]. Even though earlier studies have isolated few steroidal saponins from root
325 extracts of *Chlorophytum comosum* that have found to possess anti-tumor cytotoxic

326 properties [5-6], not much attempts were made further to investigate this plant for its
327 pharmaceutical potential. With reference to the previous studies and based on
328 ethanomedical uses specifically with respect to its role in treatment of respiratory ailments
329 ,we decided to perform the comprehensive chemical profiling of various parts of
330 *Chlorophytum comosum* and revealed the significant antiproliferative activity of
331 ethanolic roots and leaves extracts of *Chlorophytum comosum* against the cancer cells
332 lines of two different origin i.e. Lung (A549, H1299) and Breast (MCF-7). Our study also
333 noted that the selective and specific response of the crude extracts were towards cancer
334 cell lines as no cell inhibitory effects were seen on normal Lung (L-132) cell line when
335 tested comparatively. The maximum antiproliferative effects with high selectivity were
336 seen on MCF-7 and A549 cell lines with IC_{50} values < 100µg/ml (Figure 3). In case of
337 H1299 cell line no significant antiproliferation was recorded in roots extracts (IC_{50} value>
338 100µg/ml) however leaves extract showed moderate activity towards H1299 cell line
339 (IC_{50} value = 82.63 µg/ml). These results are in accordance of the previous studies where
340 Butanolic root fractions of *Chlorophytum comosum* yielded significant anti-tumor
341 promoter activity against tumor promoter induced phospholipids metabolism of HeLa cell
342 lines[5] In another study conducted by Matushita et al., apoptosis induction by Butanolic
343 extracts in four human cancer cell lines (HeLa, CCRF-HSB-2,HL-60 and U937) were
344 seen [4]. Chinese herbs are the excellent source of bioactive natural products that have
345 been found to inhibit proliferation, induce apoptosis, suppress angiogenesis, retard
346 metastasis and enhance chemotherapy, exhibiting anti-cancer potential both in vitro and
347 in vivo [20]. To discover new potential sources of anticancer plants, initial in vitro
348 cytotoxic screening and chemical profiling of the plant is an important step and provides
349 basic evidence of availability of active metabolites which needs to be further validated by
350 isolation and characterization studies followed by in vivo screening. Our study provides

351 the initial data for the selection of this plant for its consideration towards the isolation of
352 novel anticancer compounds.
353 Saponins are the known cytotoxic agents and possess strong haemolytic activity [21].GC-
354 MS findings from our studies revealed saponins as major constituents in roots portion
355 while phenols were mainly found to be present in leaves extracts. To rule out the
356 possibility of toxic effects of the extracts, we measured the anti-haemolytic activity of the
357 extracts using haemolysis assay. No significant haemolytic studies were observed in both
358 leaves and roots extract which may suggest the possibility of mechanism of action of
359 these phytoconstituents at the synergistic level. Similarly high phenolic content of leaves
360 extract as indicated by GC-MS and TPC measurement might have been responsible for
361 the better antioxidant effects in leaves extract as compared to root extracts. In a study
362 conducted by Deore et al. methanolic roots extract possessed the strongest antioxidant
363 activity among various species of Chlorophytum [22]. A plethora of evidences supports
364 phenolic components as a strong antioxidant and anticancer agents [23-24]. Compounds
365 like Purpurogallin as recorded in LC-MS data is a suggested anticancer compound which
366 inhibits mitogen-activated protein kinase kinase 1/2 (MEK1/2) signaling
367 pathway[25].Thus, to best of our knowledge our study is the first systematic and
368 comparative profiling of the plant marking the presence of other anticancer active
369 molecules than saponins , however this is the initial screening which needs to be further
370 validated by isolation and characterization studies to find out the lead molecules involved
371 in anticancer therapy.

372 **Conclusion**

373 We conclude that *Chlorophytum comosum* possess diversified active constituents of
374 therapeutic potential (chiefly phenols and saponins) that in synergy possess significant
375 antioxidant and antiproliferative potential against the breast (MCF-7) and lung cancer (A-

376 549) cell lines. Our study also justifies the traditional use of *Chlorophytum comosum* in
377 treatment of lung associated disorders.

378 **List of Abbreviations**

379 CCLA : *Chlorophytum comosum* leaf aqueous extract
380 CCRA : *Chlorophytum comosum* roots aqueous extract
381 CCLE : *Chlorophytum comosum* leaf ethanolic extract
382 CCRE : *Chlorophytum comosum* roots ethanolic extract
383 TPCs : Total Phenolic Contents
384 DPPH : 2, 2-diphenyl-1-picrylhydrazyl
385 FRAP : Ferric Reducing Antioxidant Power
386 GC-MS: Gas Chromatography Mass Spectrometry
387 LC-ESI-MS: Electrospray Ionization Mass Spectrometry

388 **Declaration**

389 **Ethics Approval and Consent to Participate**

390 **Not Applicable**

391 **Consent for Publication**

392 **Not Applicable**

393 **Availability of Data and Materials**

394 All data generated or analysed during this study are included in this published article [and
395 its supplementary information files].

396 **Competing Interests**

397 "The authors declare that they have no competing interests"

398 **Author's Contribution**

399 The study conceptualization and design was done by Farooqi H. The experiment
400 execution, data collection, data analysis and manuscript drafting was completed by

401 Adhami S, Abdin M.Z. provided the necessary facilities for the study and Malik A.A.

402 provided with the suggestions for improved manuscript.

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476 **Table 1 Identified chemical constituents and their % content from leaves of *Chlorophytum comosum* by GC/MS**

Peak No.	Identified Compound Name (IUPAC)	Common Name	Compound Class	CAS No.	Pub Chem CID	Molecular Weight	Molecular Formula	% area	Retention Time
1	1-methylpiperidine	N-Methylpiperidine	t-Amines	626-67-5	12291	99.177	$C_6H_{13}N$	0.42	5.768
2	2-methyl-N-(2-methylbutyl) butan-1-imine	1-Butanamine, 2-methyl-N-(2-methylbutylidene)-	Aliphatic Imines	54518-97-7	521517	155.285	$C_{10}H_{21}N$	0.79	7.840
3	3-methyl-N-(3-methylbutyl)butan-1-imine	Isopentylidene isopentylamine	Amines	35448-31-8	118823	155.285	$C_{10}H_{21}N$	1.67	8.048
4	2-methoxyphenol	Guaiacol	Phenols	90-05-1	460	124.139	$C_7H_8O_2$	1.38	9.021
5	Undecane	Undecane	Alkane Hydrocarbon	1120-21-4	14257	156.313	$C_{11}H_{24}$	2.44	9.219
6	butan-2-yloxy-butyl-dimethylsilane	2butyl(dimethyl)silyloxybutane	Organosilicon	NA	582888	188.386	$C_{10}H_{24}OSi$	2.42	10.743
7	butoxy(trimethyl)silane	1-Butanol, trimethylsilyl ether	Organosilicon	1825-65-6	519537	146.305	$C_7H_{18}OSi$	5.81	12.335
8	2-tert-butyl-5-(hydroxymethyl)-5-methyl-1,3-dioxolan-4-one	2-t-Butyl-5-hydroxymethyl-5-methyl-[1,3]dioxolan-4-one	Oxalidinone	NA	554337	188.223	$C_9H_{16}O_4$	41.05	12.895
9	4-ethenyl-2-methoxyphenol	4-vinylguaiacol	Phenols	7786-61-0	332	150.177	$C_9H_{10}O_2$	1.28	13.310
10	2,6-dimethoxyphenol	Syringol	Phenols	91-10-1	7041	154.165	$C_8H_{10}O_3$	1.08	13.933

Peak No.	Identified Compound Name (IUPAC)	Common Name	Compound Class	CAS No.	Pub Chem CID	Molecular Weight	Molecular Formula	% area	Retention Time
11	3-(hydroxymethyl)phenol	3-Hydroxybenzyl alcohol	Phenols	620-24-6	102	124.139	$C_7H_8O_2$	7.59	14.582
12	dodecane-1-thiol	1-dodecanethiol	Thiols	112-55-0	8195	202.4	$C_{12}H_{26}S$	0.66	17.032
13	2-tert-butyl-4-methoxyphenol	(1,1Dimethylethyl)-4-methoxyphenol	Aromatic Ether	25013-16-5	8456	180.247	$C_{11}H_{16}O_2$	1.68	17.332
14	2-cyclohepta-2,4,6-trien-1-yl-1H-pyrrole	2-cyclohepta-2,4,6-trien-1-yl-1H-pyrrole	Pyrrole Alkaloids	NA	593678	157.216	$C_{11}H_{11}N$	0.66	17.646
15	Cyclopenta[C]Pyran-1-ol, 1,4a,5,6,7,7a-Hexahydro-4,7-Dimethyl acetate, [1S-(1.Alpha.,4a.Alpha.,7.Beta.,7a.alpha.)	(1S)-1 Acetooxymyodesert-3-ene	Unknown	NA	NA	210	$C_{12}H_{18}O_3$	0.19	19.107
16	tetradecyl prop-2-enoate	2-Propenoic acid,tetradecyl ester	Carboxyester	21643-42-5	88984	268.441	$C_{17}H_{32}O_2$	2.35	19.183
17	(2R,5S,6S)-2,6,10,10-tetramethyl-1-oxaspiro[4.5]decan-6-ol	2,6,10,10-Tetramethyl-1-oxaspiro[4.5]decan-6-ol	Terpenoid	77981-89-6	23624156	212.333	$C_{13}H_{24}O_2$	0.34	20.426
18	2,2-dimethyl-3-(2-methylprop-1-enyl)cyclopropane-1-carboxylic acid	Chrysanthemic acid	Cyclopropane carboxylic acid	10453-89-1	2743	168.236	$C_{10}H_{16}O_2$	0.86	20.468

Peak No.	Identified Compound Name (IUPAC)	Common Name	Compound Class	CAS No.	Pub Chem CID	Molecular Weight	Molecular Formula	% area	Retention Time
19	bis(2-methylpropyl) benzene-1,2-dicarboxylate	Phthalic acid, diisobutyl ester	phthalate ester	84-69-5	6782	278.348	$C_{16}H_{22}O_4$	0.4	21.447
20	6-methylhepta-1,6-dien-2-ylbenzene	(5-Methyl-1-methylene-5-hexenyl)benzene	Unknown	NA	576233	186.298	$C_{14}H_{18}$	1.11	22.982
21	6-methylhepta-1,6-dien-2-ylbenzene	(5-Methyl-1-methylene-5-hexenyl)benzene	Unknown	NA	576233	186.298	$C_{14}H_{18}$	1.71	23.018
22	Trimethylsilyl hexadecanoate	Palmitic acid, TMS	Fatty acid	55520-89-3	521638	328.612	$C_{19}H_{40}O_2Si$	0.78	23.695
23	1-Methyl-5-phenylbicyclo[3.2.0]Heptane	1-Methyl-5-phenylbicyclo[3.2.0] Heptane	Unknown	NA	576531	186.298	$C_{14}H_{18}$	1.03	23.812
24	3-(2-phenylaziridin-1-yl)propane nitrile	3-(2-Phenyl-1-aziridinyl)propane nitrile	Aziridine	NA	563034	171.231	$C_{11}H_{12}N_2$	0.76	24.115
25	methyl (Z)-octadec-9-enoate	Methyl Oleate	Fatty acid methyl ester	112-62-9	5364509	296.495	$C_{19}H_{36}O_2$	0.73	24.365
26	methyl octadecanoate	Methyl Sterate	Fatty acid methyl ester	112-61-8	8201	298.511	$C_{19}H_{38}O_2$	0.63	24.664
27	ethyl (E)-3-(4-methylphenyl)prop-2-enoate	Ethyl-4-methyl cinnamate	Methyl ester of Cinnamic acid	20511-20-0	641318	190.242	$C_{12}H_{14}O_2$	0.79	26.29

Peak No.	Identified Compound Name (IUPAC)	Common Name	Compound Class	CAS No.	Pub Chem CID	Molecular Weight	Molecular Formula	% area	Retention Time
28	bis(2-ethylhexyl) hexanedioate	DEHA	Diester	103-23-1	7641	370.574	$C_{22}H_{42}O_4$	4.08	27.558
29	5,5bis (heptylsulfanyl)pentane-1,2,3-triol	D-Ribose, 2-deoxy-bis(thioheptyl)-dithioacetal	Polysaccharides	NA	575898	380.646	$C_{19}H_{40}O_3S_2$	3.24	28.931
30	bis(2-ethylhexyl) benzene-1,2-dicarboxylate	Bis(2-ethylhexyl)phthalate	Ester of phthalic acid	117-81-7	8343	390.564	$C_{24}H_{38}O_4$	1.54	29.51
31	(3S,8S,9S,10R,13R,14S,17R)-17-[(2R,5R)-5-ethyl-6-methylheptan-2-yl]-10,13-dimethyl-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-ol	β-Sitosterol	Phytosterols	83-46-5	222284	414.718	$C_{29}H_{50}O$	1.24	38.051
32	(E)-5-[(1S,2R,4aR,8aR)-1,2,4a,5-tetramethyl-2,3,4,7,8,8a-hexahydronaphthalen-1-yl]-3-methylpent-2-en-1-ol	Kolavenol	Diterpenoids	19941-83-4	6442554	290.491	$C_{20}H_{34}O$	0.49	39.571

Peak No.	Identified Compound Name (IUPAC)	Common Name	Compound Class	CAS No.	Pub Chem CID	Molecular Weight	Molecular Formula	% area	Retention Time
33	(1R,2S,4S,5'S,6R,7S,8R,9S,12S,13S,16S,18R)-5',7,9,13-tetramethylspiro[5-oxapentacyclo[10.8.0.02,9.04,8.013,18]icosane-6,2'-oxane]-16-ol	Sarsasapogenin	Steroids	126-19-2	92095	416.646	$C_{27}H_{44}O_3$	7.54	42.569
34	(1S,2S,4S,5'R,6R,7S,8R,9S,12S,13R,16S)-5',7,9,13-tetramethylspiro[5-oxapentacyclo[10.8.0.02,9.04,8.013,18]icos-18-ene-6,2'-oxane]-16-ol	Diosgenin	Sapogenins	512-04-9	99474	414.63	$C_{27}H_{42}O_3$	1.27	43.393

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485 **Table 2 Identified chemical constituents and their % content from roots of *Chlorophytum comosum* by GC/MS**

Peak No.	Identified Compound Name (IUPAC)	Common Name	Compound Class	CAS No.	PubChem CID	Molecular Weight	Molecular Formula	% Area	Retention Time
1	Dodecane	Dodecane	Alkane Hydrocarbon	112-40-3	8182	170.34	$C_{12}H_{26}$	9.37	9.213
2	4a,8-dimethyl-2-prop-1-en-2-yl-2,3,4,5,6,7-hexahydro-1H-naphthalene	Naphthalene	Aromatic Hydrocarbon	41071-31-2	605019	204.357	$C_{15}H_{24}$	0.64	14.949
3	Diethyl benzene-1,2-dicarboxylate	Diethyl phthalate	Benzoic acid esters	84-66-2	6781	222.24	$C_{12}H_{14}O_4$	2.29	17.725
4	4-trimethylsilyloxycyclohexan-1-ol	Cis -1,4-cyclohexanediol,o-(trimethylsilyl)	Fatty Alcohols	54725-69-8	554465	188.342	$C_{19}H_{20}O_2Si$	1.94	18.672
5	(3E,5E)-2,6-dimethylocta-3,5-diene	2,7-dimethylocta-3,5-diene	Alkenes	28980-73-6	17939649	138.254	$C_{10}H_{18}$	0.91	19.126
6	(6S) 6-methyloctan-1-ol	6- Methyl-1-octanol	Aliphatic Hydroxy Compound	110453-78-6	520908	144.258	$C_9H_{20}O$	0.77	19.206
7	Trimethylsilyl hexadecanoate	Palmitic acid	Fatty Acids	55520-89-3	521638	328.612	$C_{19}H_{40}O_2Si$	2.98	23.705
8	Methyl 9,10-Dideutero-9-Octadecenoate	Methyl Elaidate	Fatty Acids	1937-62-8	5280590	298.00	$C_{19}H_{34}D_2O_2$	2.95	24.371

9	Methyl 15-methylhexadecanoate	Hexadecanoic acid, 15-methyl-,methyl ester	Fatty Acids	6929-04-0	522345	284.484	$C_{18}H_{36}O_2$	2.95	24.669
10	bis(2-ethylhexyl) hexanedioate	Diethylhexyl adiapate	Esters	103-23-1	7641	370.574	$C_{22}H_{42}O_4$	18.9	27.56
11	N-[4-(2-tert-butyl-5-oxo-1,3-dioxolan-4-yl)butyl]formamide	Formamide	Amide	NA	582477	243.303	$C_{12}H_{21}NO_4$	1.35	28.651
12	bis(2-ethylhexyl) benzene-1,2-dicarboxylate	Bis(2-ethylhexyl) phthalate	Esters	117-81-7	8343	390.564	$C_{24}H_{38}O_4$	7.35	29.514
13	Sarsasapogenin 3-tosylate	Tigogenin tosylate	Steroidal Glycoside	NA	587000	570.829	$C_{34}H_{50}O_5S$	4.43	36.693
14	(3S,8S,9S,10R,13R,14S,17R)-17-[(2R,5R)-5-ethyl-6-methylheptan-2-yl]-10,13-dimethyl-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-ol	β-Sitosterol	Phytosterols	83-46-5	222284	414.718	$C_{29}H_{50}O$	7.79	38.062
15	2,2,4a,7a-Tetramethyl-1,2a,3,4,5,6,7,7b-octahydrocyclobuta[e]inden-5-ol	2,2,4a,7a-Tetramethyldecahydro-1H-cyclobuta[e]inden-5-ol	Sesquiterpenes	NA	573804	222.372	$C_{15}H_{26}O$	4.97	39.568
16	Neotigogenin	25S-Tigogenin	Triterpenoids	470-01-9	12304433	416.646	$C_{27}H_{44}O_3$	16.2	42.566
17	(1R,2S,4S,5'R,6R,7S,8R,9S,12S,13S,18S)-5',7,9,13-tetramethylspiro[5 oxapentacyclo[10.8.0.02,9.04,8.013,18]icosane-6,2'-oxane]-16-one	Yuccagenone	Steroidal Glycoside	470-07-5	101692	414.63	$C_{27}H_{42}O_3$	14.0	43.376

486 NA: Not Available, Database - Wiley 8. Lib. / NIST14.l

487 **Table 3 Tentatively identified metabolites in roots of *Chlorophytum comosum* by LC-ESI-MS (+ ion mode)**

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Analyte No.	Tentative allotment of compounds based on METLIN	Parent ion (m/z)	Peak Intensity	Mass Recorded (METLIN)	METLIN ID
1.	5,6-Dichloro-1,3-cyclohexadiene	148.99	6.263e6	147.98	69011
2.	5-Fluoroindole-2-Carboxylic Acid	180.04	4.115e6	179.03	44300
3.	4,5-Dichloro-3H-1,3-dithiol-2-one	186.88	2.011e6	185.87	89030
4.	Purpurogallin	221.04	1.375e6	220.03	43934
5.	Ginsenoyne B	295.14	8.843e5	294.13	93731
6.	Salicylic acid beta-D-glucoside	301.09	5.089e6	300.08	95685
7.	gamma-Glutamyl-beta-(isoxazolin-5-on-2-	302.09	9.296e5	301.09	95006
8.	11beta-Chloromethylestradiol	321.16	7.740e5	320.15	69957
9.	Heneicosanedioic acid	357.30	1.749e6	356.29	35988
10.	Oleyl Anilide	358.31	4.706e6	357.30	44935
11.	Hexadecyl Acetyl Glycerol	359.31	1.121e6	358.30	43452
12.	6-Bromo-5E,9Z,13Z-docosatrienoic acid	413.20	1.289e7	412.19	96831
13.	7,8,3',4'-Tetramethoxy-6 6''-dimethylpyrano [2'',3'':5,6]flavone	425.15	2.830e6	424.15	49820
14.	Isosyringinoside	535.20	7.687e5	534.19	95276
15.	Sagecoumarin	537.09	1.345e6	536.09	89672
16.	4-(4-Hydroxyphenyl)- 2-butanone O- [2-galloyl-6-p-coumaroylglucoside]	625.18	1.132e6	624.18	93899
17	Gnidicin	629.23	8.064e5	628.23	67423

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519 **Table 4 Tentatively identified metabolites in leaves of *Chlorophytum comosum* by LC-ESI-MS (+ ion mode)**

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Analyte No.	Tentative allotment of compounds based on METLIN	Parent ion (m/z) Positive ion mode [M+H]	Peak Intensity	Mass Recorded (METLIN)	METLIN ID
1.	5,6-Dichloro-1,3-cyclohexadiene	148.9924	7.904e6	147.98	69011
2.	Serratanidine	296.1872	2.612e6	295.1784	67995
3.	Salicylic acid beta-D-glucoside	301.0908	6.044e6	300.0845	95685
4.	3-(2-Heptenyloxy)-2-hydroxypropyl undecanoate	357.2993	2.186e6	356.2927	89668
5.	Oleyl Anilide	358.3117	6.640e6	357.3032	44935
6.	Methyl (9Z)-6'-oxo-6,5'-diapo-6-carotenoate	393.2399	4.100e6	392.2351	88088
7.	6-Bromo-5E,9Z,13Z-docosatrienoic acid	413.2067	4.100e6	412.1977	96831

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535 **Table 5 Dose dependent % haemolytic activity observed in *Chlorophytum comosum* extracts.**
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Samples	Treatment (µg//ml)	% Haemolysis
Control	PBS	0.00
Positive control	1% SDS	85.75
CCLE	10	3.25
	20	5.30
	40	9.11
	80	17.18
	160	19.08
	320	28.11
CCRE	10	3.40
	20	7.52
	40	14.01
	80	19.24
	160	24.94
	320	30.01

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546 **1 X PBS buffer served as control. % haemolytic activity were measured against 1% SDS which served as positive control.**

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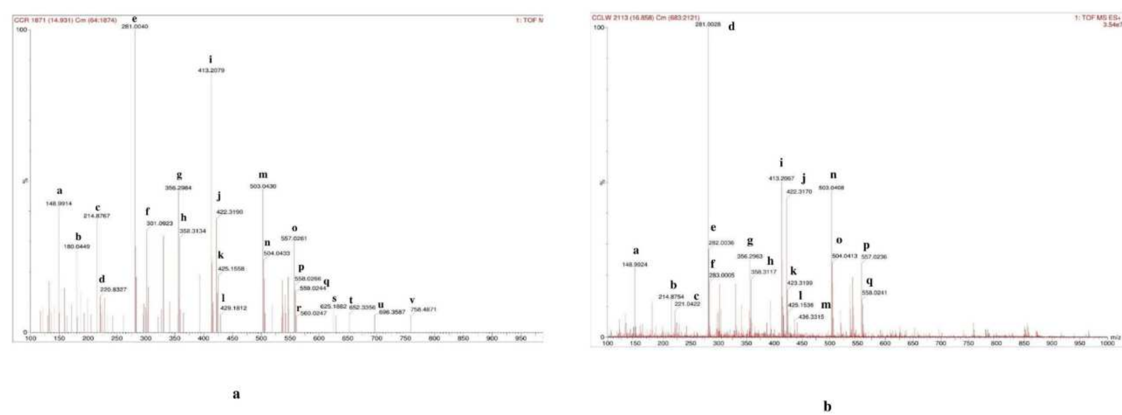
548 **Figure 1** Total ion chromatogram of *Chlorophytum comosum* aqueous root (a) and leaf extract (b) by LCESI- MS.



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550 Selected peaks in roots were identified as (d) Purpurogallin, (f) Salicylic acid beta-D-glucoside, (g) Heneicosanedioic acid, (h) Oleyl Anilide and in

551 leaf as (a) 5,6-Dichloro-1,3-cyclohexadiene , (h) Oleyl Anilide (i) 6-Bromo-5E,9Z,13Z-docosatrienoic acid when compared with XCMS Metlin

552 database in positive ion mode. Note: At some peaks no metabolites were recorded in database.

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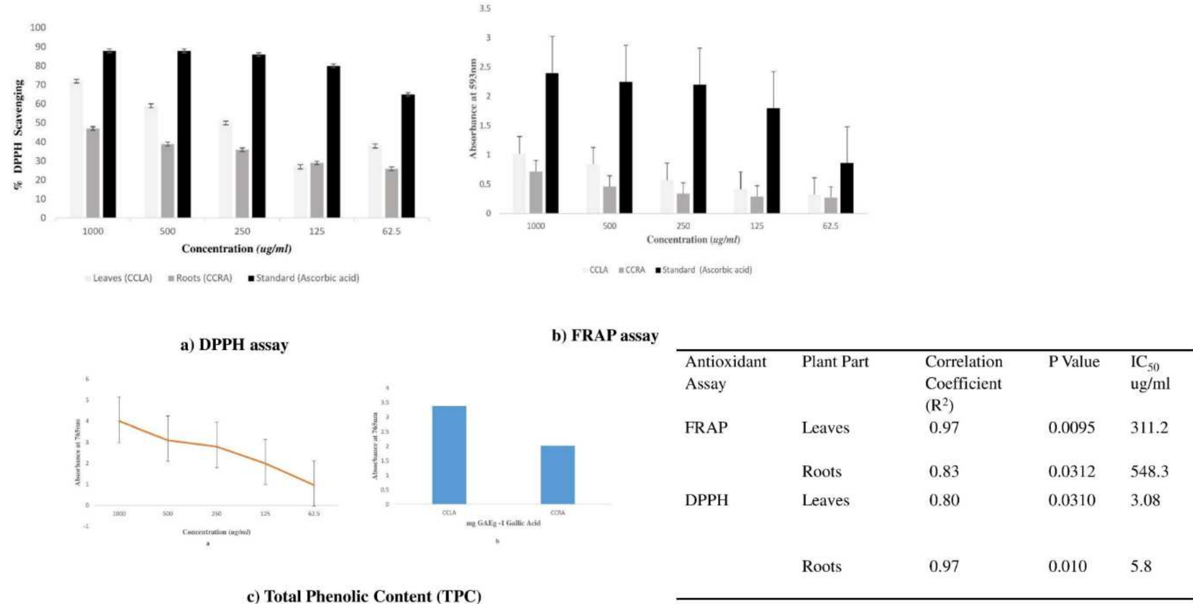
557 **Figure 2** Measurement of antioxidant potential of *Chlorophytum comosum* by DPPH, FRAP and TPC assays



Antioxidant Assay	Plant Part	Correlation Coefficient (R^2)	P Value	IC_{50} ug/ml
FRAP	Leaves	0.97	0.0095	311.2
	Roots	0.83	0.0312	548.3
DPPH	Leaves	0.80	0.0310	3.08
	Roots	0.97	0.010	5.8

(a) Dose dependent % scavenging of DPPH by aqueous leaf (CCLA) and roots (CCRA) extract of *Chlorophytum comosum*. (b) Total reducing capacity of leaf and roots of *Chlorophytum comosum* as observed with dose dependent decrease in absorbance by FRAP assay. The values are mean ± SD of three independent experiments with a correlation coefficient (R^2= 0.9921) and p value < 0.05. (c) Total phenolic content available

567 in different parts of *Chlorophytum comosum*. (c-a) standard curve of gallic acid, (c-b) % phenolic content in roots and leaves of *C. comosum* Total

568 phenolic content was expressed as mg gallic acid equivalent (GAE) per gram of dried sample.

569 **Figure 3** MTT cell viability assay.

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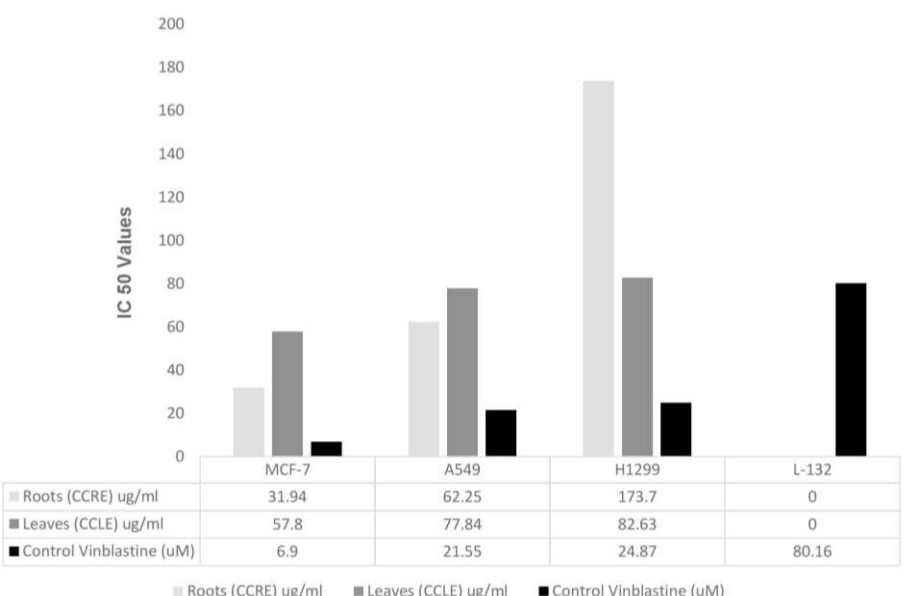

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573 Antiproliferative activity of ethanolic roots and leaf extract were evaluated in a dose dependent exposure (10µg/ml-320µg/ml) of test samples for

574 24hrs. Vinblastine was used as control Dose dependent cell growth inhibitory effects of CCLE and CCRE on different cell lines and response of

575 standard vinblastine on cancer versus normal cell line L-132 is represented with their respective IC50 values. In L-132 IC50 values were not

576 calculated for CCLE and CCRE due to lesser percentage inhibition (<50%). The data is statistically significant with $P < 0.05$.

Figures

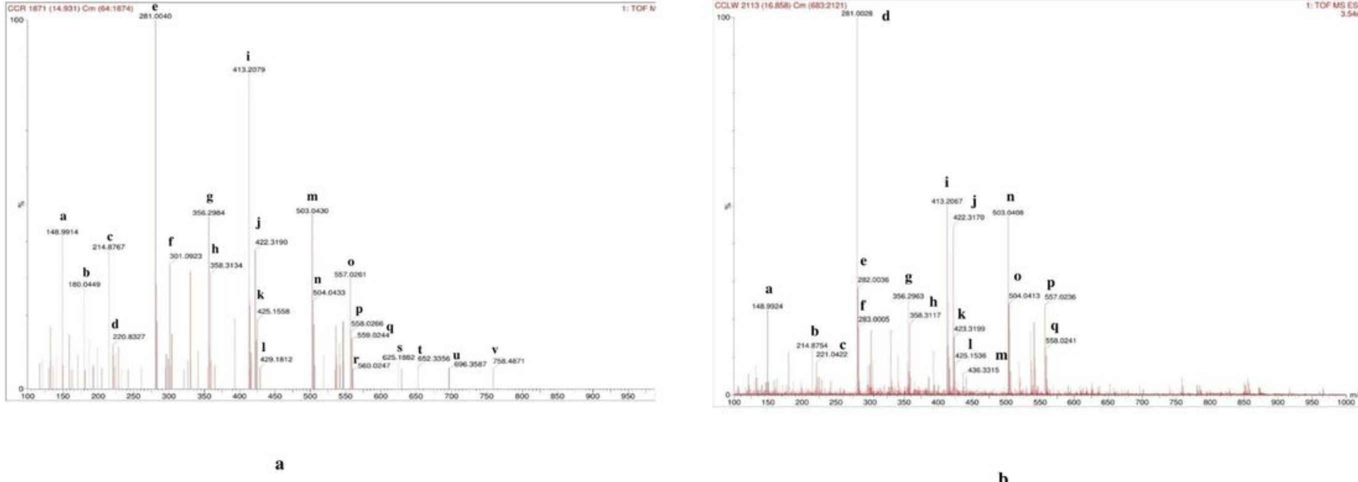
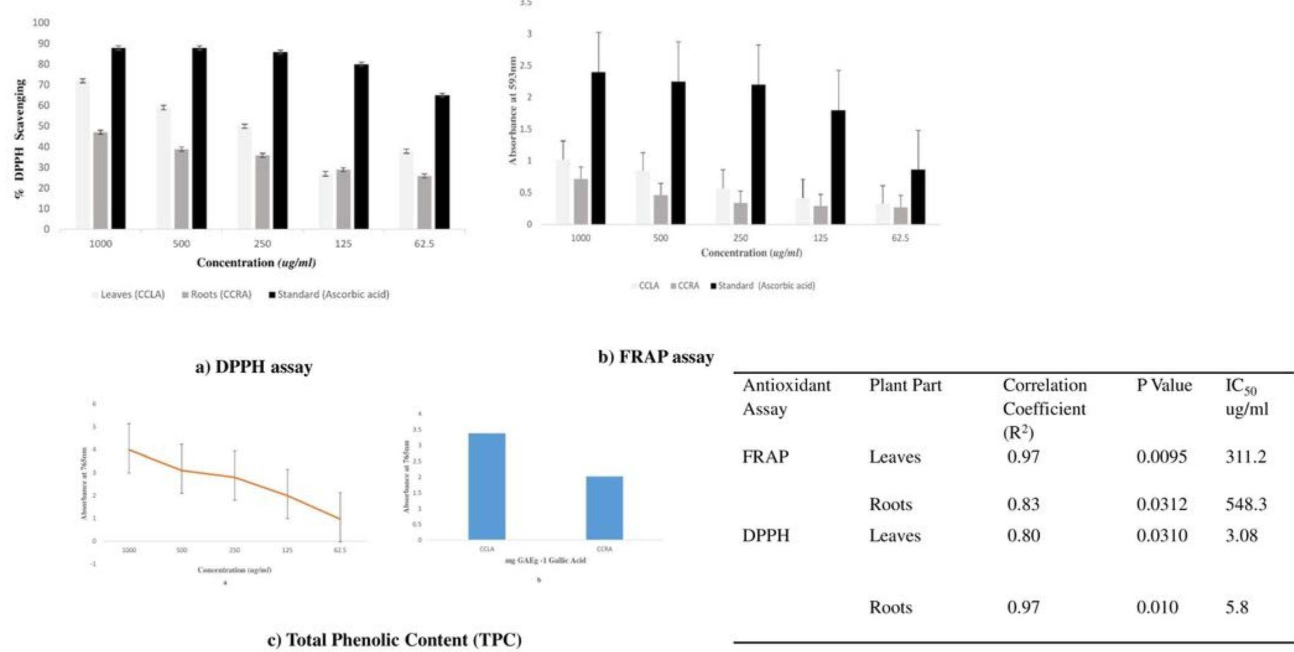


Figure 1

Total ion chromatogram of Chlorophytum comosum aqueous root (a) and leaf extract (b) by LCESI- MS. Selected peaks in roots were identified as (d) Purpurogallin, (f) Salicylic acid beta-D-glucoside, (g) Heneicosanedioic acid, (h) Oleyl Anilide and in leaf as (a) 5,6-Dichloro-1,3-cyclohexadiene , (h) Oleyl Anilide (i) 6-Bromo-5E,9Z,13Z-docosatrienoic acid when compared with XCMS Metlin database in positive ion mode. Note: At some peaks no metabolites were recorded in database.



Antioxidant Assay	Plant Part	Correlation Coefficient (R^2)	P Value	IC_{50} ug/ml
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Figure 2

Measurement of antioxidant potential of Chlorophytum comosum by DPPH, FRAP and TPC assays (a) Dose dependent % scavenging of DPPH by aqueous leaf (CCLA) and roots (CCRA) extract of Chlorophytum comosum. (b) Total reducing capacity of leaf and roots of Chlorophytum comosum as observed with dose dependent decrease in absorbance by FRAP assay. The values are mean ± SD of three independent experiments with a correlation coefficient (R2= 0.9921) and p value < 0.05. (c) Total phenolic content available in different parts of Chlorophytum comosum. (c-a) standard curve of gallic acid, (c-b) % phenolic content in roots and leaves of C. comosum Total phenolic content was expressed as mg gallic acid equivalent (GAE) per gram of dried sample.

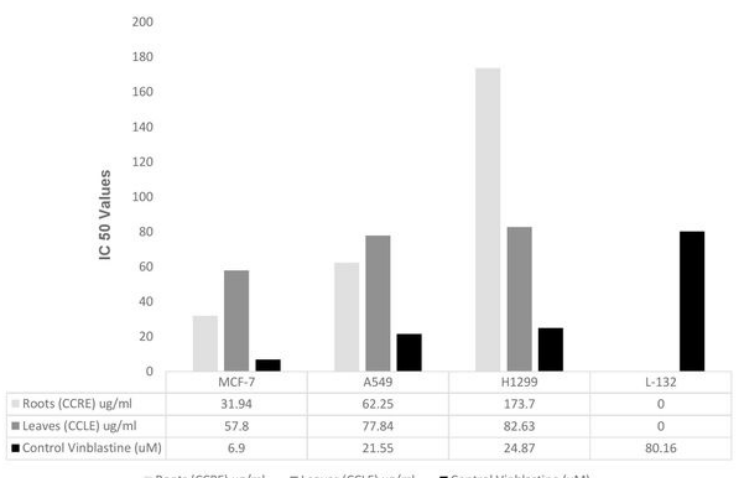

Figure 3

MTT cell viability assay. Antiproliferative activity of ethanolic roots and leaf extract were evaluated in a dose dependent exposure (10µg/ml-320µg/ml) of test samples for 24hrs. Vinblastine was used as control Dose dependent cell growth inhibitory effects of CCLE and CCRE on different cell lines and response of standard vinblastine on cancer versus normal cell line L-132 is represented with their respective IC50 values. In L-132 IC50 values were not 575 calculated for CCLE and CCRE due to lesser percentage inhibition (<50%). The data is statistically significant with P <0.05.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Table1AdhamietalGCMSANALYSISOFLEAVESOFCC.docx
- Table3AdhamietalLCESIMSROOTSCC.docx
- Table2AdhamietalGCMSANALYSISOFROOTSOFCC.docx
- Table4AdhamietalLCESIMSLEAVESCC.docx
- Table5AdhamietalHaemolysisbyCC.docx