

**Table S1: Phytochemical composition of the isolated Plant extracts**

S.No	Chemical test	Plantain peel extract	Aloe vera extract	<i>Calendula officinalis</i> flower extract
1	<b>Test for Saponins</b>	-	-	+++
2	<b>Test for Tannins</b> (Bayer's Test)	+++	+++	+++
3	<b>Test for Flavonoids</b> (Ferric chloride test)	-	-	-
4	<b>Test for Flavonoids</b> (Ferric chloride test)	-	+++	-
5	<b>Test for Alkaloids</b> (Mayer's test)	+++	+++	-
6	<b>Test for Glycosides</b>	-	-	-
7	<b>Test for Coumarins</b>	-	-	+++
8	<b>Test for Terpenoids and steroids</b> (Salkowski test)	-	-	+++
9	<b>Test for Quinones</b> (Sulphuric acid test)	-	-	+++
10	<b>Test for Carbohydrates</b> (Molisch's test)	+++	+++	+++
11	<b>Test for Proteins</b>	+++	-	-
12	<b>Presence of Reducing sugar</b> (Benedict's test)	+++	-	+++
13	<b>Presence of Polysaccharide</b>	-	-	-

**Table S2: Phytochemical constituents of Plantain peel extract using GC-MS analysis**

S No	Chemical constituent	Molecular weight	Formula	R.T (min)	Peak area percentage (%)
1	Betulin	442	C <sub>30</sub> H <sub>50</sub> O <sub>2</sub>	41.397	67.75
2	2-(4-{[4-oxo-3-phenyl-2-(phenylimino)-1,3-thiazolidin-5-ylidene]methyl}phenoxy)acetamide 2-[4-(4-oxo-3-phenyl-2-phenylimino-thiazolidin-5-ylidenemethyl)-phenoxy]-acetamide	429	C <sub>24</sub> H <sub>19</sub> N <sub>3</sub> O <sub>3</sub> S	42.395	3.65

3	2-(€-[(€-2-[(€-(2-hydroxyphenyl)methylidene]amino)propyl]imino)methyl]phenol.alpha.,.alpha.'-(1-methylethylenediimino)di-ortho-cresol .alpha.,.alpha.'-dipropylenedinitrilodi-o-cresol 2,2'-[(1-methyl-1,2-ethanediyl)bis(nitrilometh)	282	C <sub>17</sub> H <sub>18</sub> N <sub>2</sub> O <sub>2</sub>	42.484	12.92
4	Bicyclo[4.3.0]nonane, 4,5-dimethyl-1-(1-hydroxy-2-propyl)-5-(3-methyl-2-pentenoyl)- (2Z)-1-[7a-(2-Hydroxy-1-methylethyl)-4,5-dimethyloctahydro-1H-inden-4-yl]-3-methyl-2-penten-1-one	306	C <sub>20</sub> H <sub>34</sub> O <sub>2</sub>	44.465	7.15
5	1,8-Dioxa-5-thiaoctane, 8-(9-borabicyclo[3.3.1]non-9-yl)-3-(9-borabicyclo[3.3.1]non-9-yloxy)-1-phenyl- 2-(9-Borabicyclo[3.3.1]non-9-yloxy)-3-([2-(9-borabicyclo[3.3.1]non-9-yloxy)ethyl]sulfanyl)propyl phenyl ether	468	C <sub>27</sub> H <sub>42</sub> B <sub>2</sub> O <sub>3</sub> S	44.634	8.52

**Table S3: Phytochemical constituents of Aloe vera extract using GC-MS analysis**

S No	Chemical constituent	Molecular weight	Formula	R.T (min)	Peak area percentage (%)
1	Diethyl Phthalate 1,2-Benzenedicarboxylic acid, diethyl ester Phthalic acid, diethyl ester o-Benzenedicarboxylic acid, diethyl ester Anozol Ethyl phthalate Neantine Palatinol A Phthalol Placidol E Solvanol Unimoll	222	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>	16.860	64.62
2	1,2-Benzenedicarboxylic acid, diethyl ester phthalic acid - benzenedicarboxylic acid diethyl ester 1, 2-benzenedicarboxylic acid, diethyl ester 1,2-benzenedicarboxylic acid, diethyl ester	222	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>	17.361	12.22
3	Heneicosane n-Heneicosane	296	C <sub>21</sub> H <sub>44</sub>	18.074	4.06

	Henicosane				
4	Diethyl Phthalate 1,2-Benzenedicarboxylic acid, diethyl ester Phthalic acid, diethyl ester o-Benzenedicarboxylic acid, diethyl ester Anozol Ethyl phthalate Neantine Palatinol A Phthalol Placidol E Solvanol Unimoll	222	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>	18.258	16.99
5	2',3'-Dihydro-2',3'-epoxysatratoxin h brn 4623147 satratoxin h, 2',3'-dihydro-2',3'-epoxy-spiro(10,12:19,22a-dimethano-4h,5h,22ah-oxireno(8,9)(1,6,12)trioxacyclooctadecino(3,4-d)(1)benzopyran-11(10h),2'-oxirane)-2,14(1ah,	544	C <sub>28</sub> H <sub>32</sub> O <sub>11</sub>	44.614	2.10

**Table S4: Phytochemical constituents of *Calendula officinalis* flower extract using GC-MS analysis**

S No	Chemical constituent	Molecular weight	Formula	R.T (min)	Peak area percentage (%)
1	Anhydro-1,6-dideoxyhexo-3,4-diulose 2,5-dimethyl-3(2h)furanone 2,5-dimethyl-3-hydroxy-4-oxo-4,5-dihydrofuran 2,5-dimethyl-4-hydroxy- 3(2h)-furanone (dmhf) 2,5-dimethyl-4-hydroxy-2,3-dihydrofuran-3-one 2,5-dimethyl-4-hydroxy-3(2h)	107.58	C <sub>6</sub> H <sub>8</sub> O <sub>3</sub>	3.666	13.66
2	Propanal, 2,3-dihydroxy-, (S)- 2,3-Dihydroxypropanal L-Glyceraldehyde	398.7	C <sub>3</sub> H <sub>6</sub> O <sub>3</sub>	4.900	12.81
3	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- 3,5-Dihydroxy-6-methyl-2,3-dihydro-4H-pyran-4-one 2,3-dihydro-3,5-dihydroxy—6-methyl-4H-pyran-4-one Pyranone 2,3-Dihydro-3,5-dihydroxy-6-methyl-4-pyrone 3-Hydroxy-2,3-dihydromalto	518.52	C <sub>6</sub> H <sub>8</sub> O <sub>4</sub>	5.149	22.28
4	Diethyl Phthalate 1,2-Benzenedicarboxylic acid, diethyl ester Phthalic acid, diethyl ester o-	116.16	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>	18.255	22.95

	Benzenedicarboxylic acid, diethyl ester Anozol Ethyl phthalate Neantine Palatinol A Phthalol Placidol E Solvanol Unimoll				
5	2(4h)-benzofuranone, 5,6,7,7a-tetrahydro-6-hydroxy-4,4,7a-trimethyl-, (6s-cis)- (-)-loliolide (-)loliolide 1,3-dihydroxy-3,5,5-trimethylcyclohexylidene-4-acetic acid lactone 2(4h)-benzofuranone, 5,6,7,7a-tetrahydro-6.beta.-hydroxy-4,4,	185.31	C11H16O3	24.427	28.30

**Table S5: Conformational bonds and functional group of the prepared plant extracts**

S.No	Wavenumber	Functional bonds	Functional groups
<b>Plantain peel</b>			
1	3425	O-H stretch, H-bonded	Alcohols, phenols
2	2923	C-H stretch	Aromatics
3	2848	H-C=O: C-H stretch	Aldehydes
4	1633	C-H bend	Alkanes
5	1459	C-N stretch	Aliphatic amines
<b>Aloe vera</b>			
1	3445	O-H stretch, H-bonded	Alcohols, phenols
2	2913	C-H stretch	Aromatics
3	2852	C-H stretch	Alkanes
4	1728	-C=H bend	Aldehydes, saturated aliphatic
5	1641	N-O symmetric stretch	Nitro compounds
6	1040	C-N stretch	Aliphatic amines
<b>Calendula officinalis flower</b>			
1	3445	O-H stretch, H-	Alcohols, phenols

		bonded	
2	2913	C-H stretch	Aromatics
3	2852	C-H stretch	Alkanes
4	1728	-C=H bend	Aldehydes, saturated aliphatic
5	1641	N-O symmetric stretch	Nitro compounds
6	1040	C-N stretch	Aliphatic amines
<b>Curcumin</b>			
1	3514	O-H stretch	Free hydroxyl
2	2915	C-H stretch	Alkanes
3	2845	C-H stretch	Alkanes
4	1507	C-C stretch (in ring)	Aromatics
5	1281	C-H wag (-CH <sub>2</sub> X)	Alkyl halides

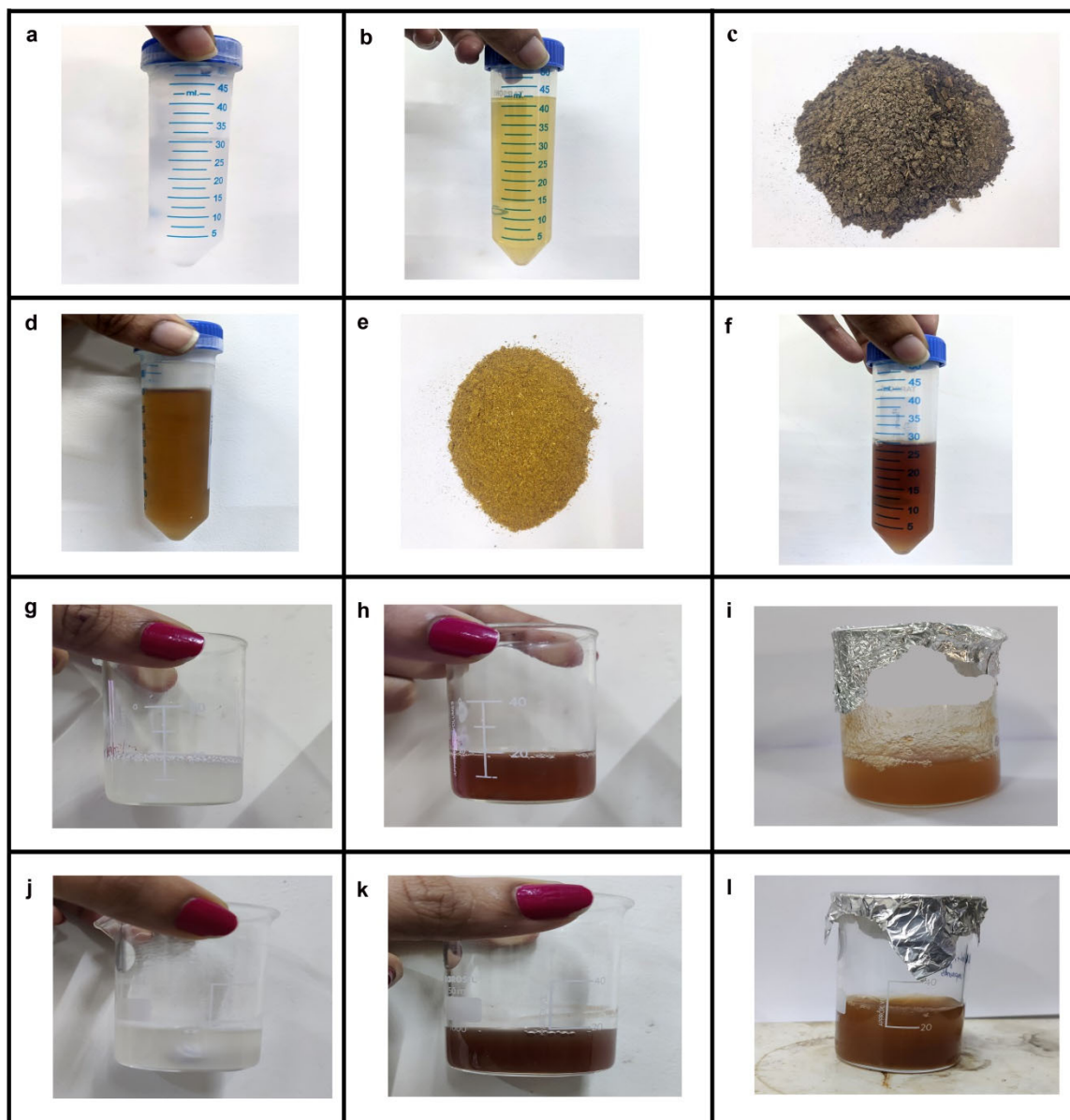
**Table S6: Conformational bonds and functional group of the synthesized hydrogels Alg/gel+Ag and Alg/gel+AgP**

S.No	Wavenumber	Functional bonds	Functional groups
<b>Alg/gel+Ag</b>			
1	3316	O-H stretch, H-bonded	Alcohols, phenols
2	1636	C-C stretch	Alkenes
3	1308	C-C stretch	Alcohols, carboxylic acids, esters
<b>Alg/gel+AgP</b>			
1	3403	O-H stretch, H-bonded	Alcohols, phenols
2	1642	C=C stretch	Alkenes
3	1330	N-O symmetric stretch	Nitro compounds

**Table S7: The molecular formulae and the purity levels of all chemicals used in the study**

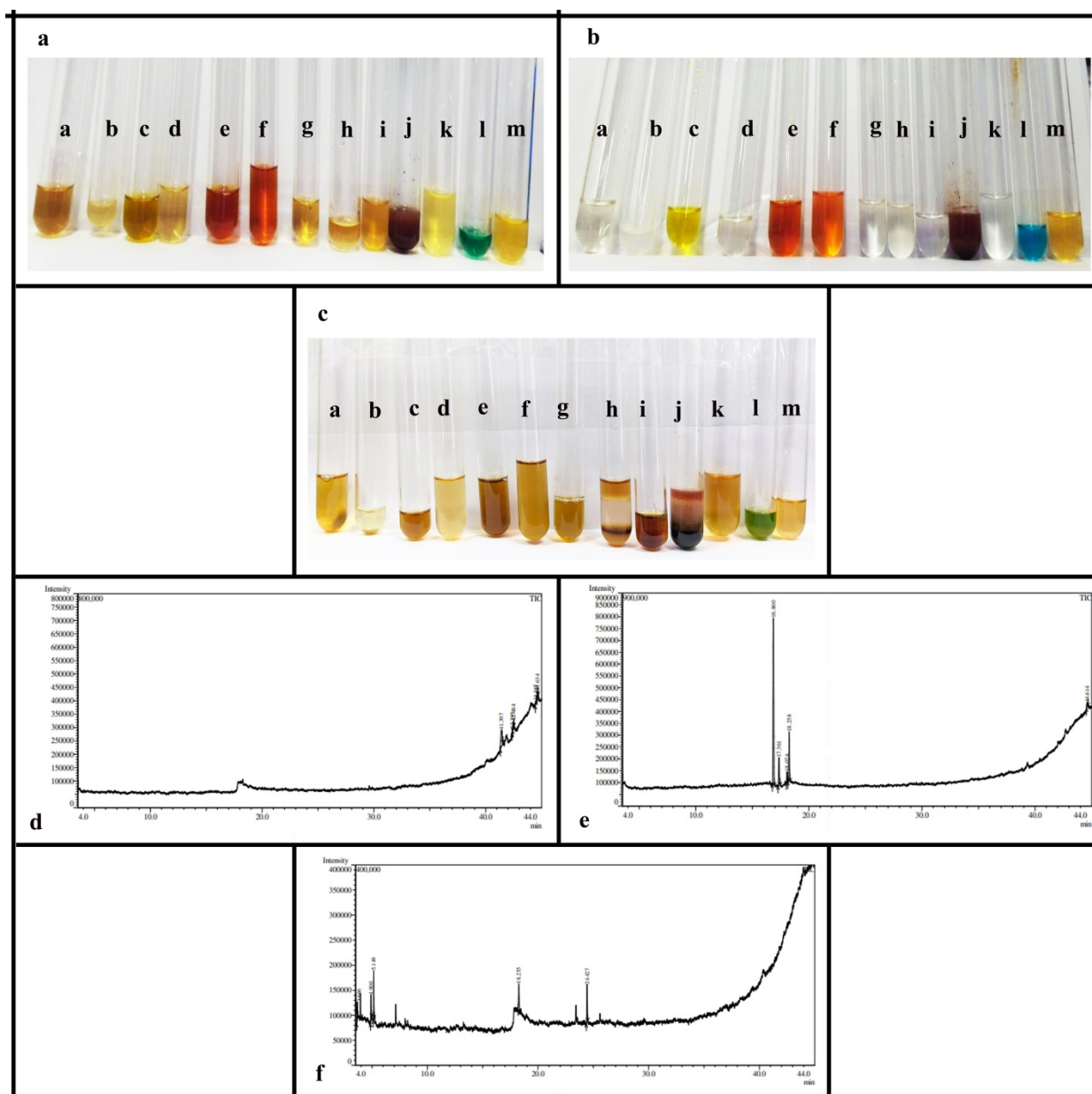
<b>S.No</b>	<b>Chemicals used</b>	<b>Molecular formulae</b>	<b>Purity levels</b>
1	Sodium alginate	$C_6H_8O_6$	$\geq 90\%$ (depending on the grade used for research or food purposes)
2	Gelatin	-	98–99% (usually denoted by bloom strength for gel-forming capacity)
3	Silver Nitrate	$AgNO_3$	$\geq 99.9\%$ (analytical reagent grade)
4	Acetone	$C_3H_6O$	99.5% or higher (analytical grade)
5	Glutaraldehyde	$C_5H_8O_3$	25%–50% (usually supplied in aqueous solution)
6	Calcium chloride	$CaCl_2$	95–99% (lab-grade and food-grade can vary)

**Figure S1 Isolation of Plant extracts and synthesis of hydrogels**



**Fig.S1.** (a) Prepared Aloe vera extract (b) Prepared Curcumin solution (c) Shade dried plantain peel powder (d) Prepared Plantain peel extract (e) Commercial *Calendula officinalis* flower powder (f) Prepared *Calendula officinalis* flower extract (g) The hydrogel Alg/gel+Ag before UV irradiation (h) The hydrogel Alg/gel+Ag after UV irradiation (i) Final Alg/gel+Ag hydrogel (j) The hydrogel Alg/gel+AgP before UV irradiation (k) The hydrogel Alg/gel+AgP after UV irradiation (l) Final Alg/gel+AgP hydrogel.

**Figure S2 Phytochemical analysis of the isolated plant extracts**



**Fig.S2.** Phytochemical analysis of (a) Prepared Plantain peel extract (b) Prepared Aloe vera extract (c) Prepared *Calendula officinalis* flower extract. GC-MS analysis of (d) Prepared Plantain peel extract (e) Prepared Aloe vera extract (f) Prepared *Calendula officinalis* flower extract