Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Development of antioxidant-rich edible active films & coatings incorporated with de-oiled ethanolic green algae extract: a candidate for prolonging the shelf life of fresh produces

Kona Mondal,[a] Sayan Kumar Bhattacharjee,[a] Chethana Mudenur,[a] Tabli Ghosh,[a] Vaibhav V. Goud,[a] and Vimal Katiyar*[a]

[a]Department of Chemical Engineering, Indian Institute of Technology Guwahati (IITG), Assam-781039, India,

Corresponding author: vkatiyar@iitg.ac.in

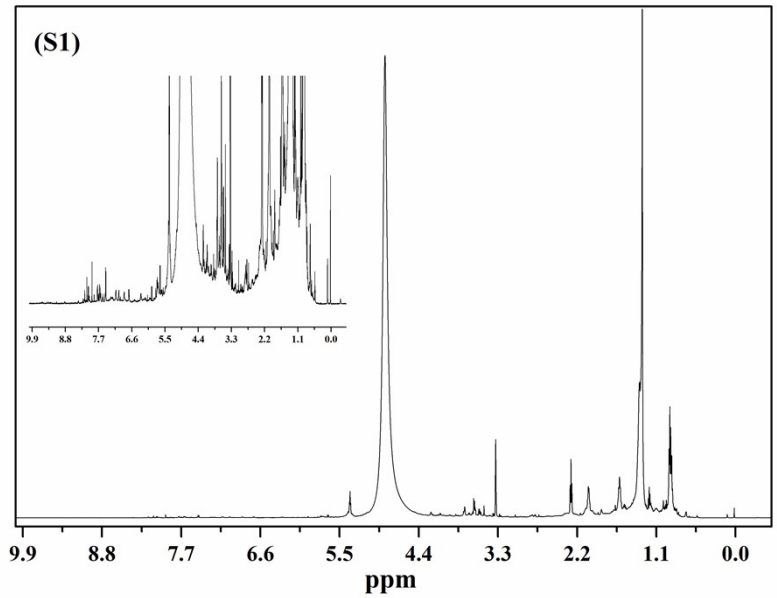

Fig. S1: ^{1}H NMR spectra of CAEE in CD_3OD_3 solvent

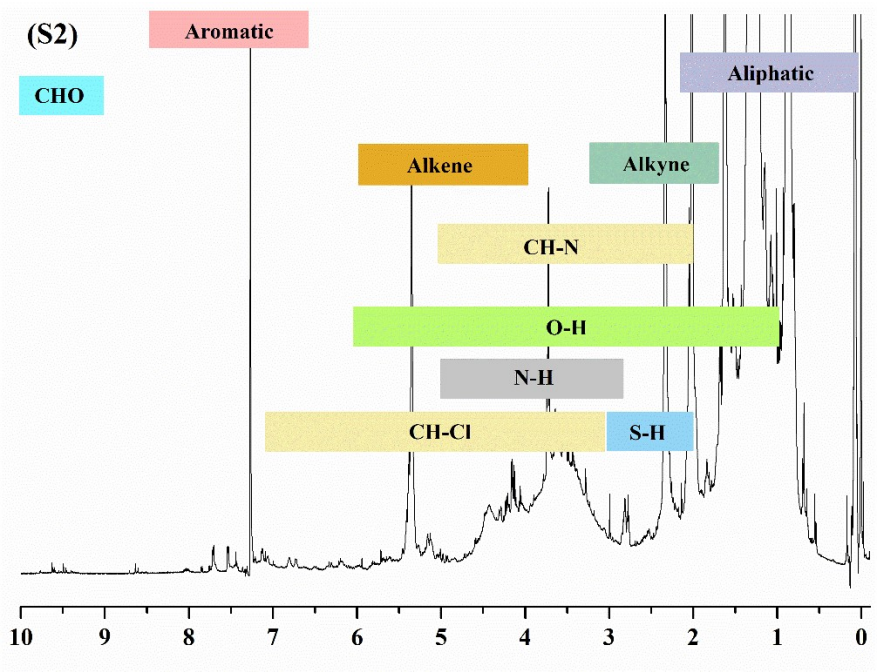

Fig. S2: ^{1}H NMR spectrum of CAEE showing range of chemical shift

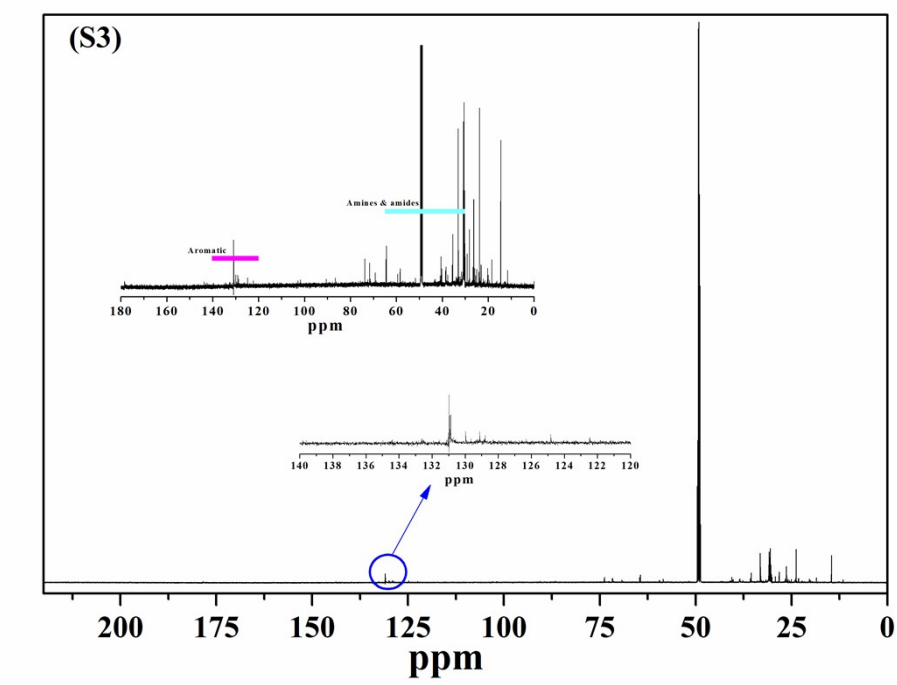

Fig. S3: ^{13}C NMR spectra of CAEE in CD_3OD_3 solvent

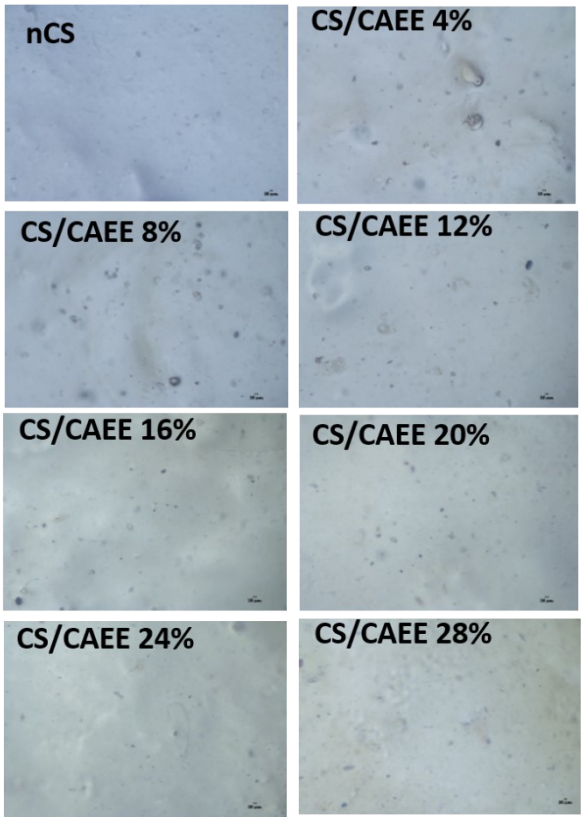

Fig. S4: Polarized optical microscopy image of developed CS/CAEE films with control

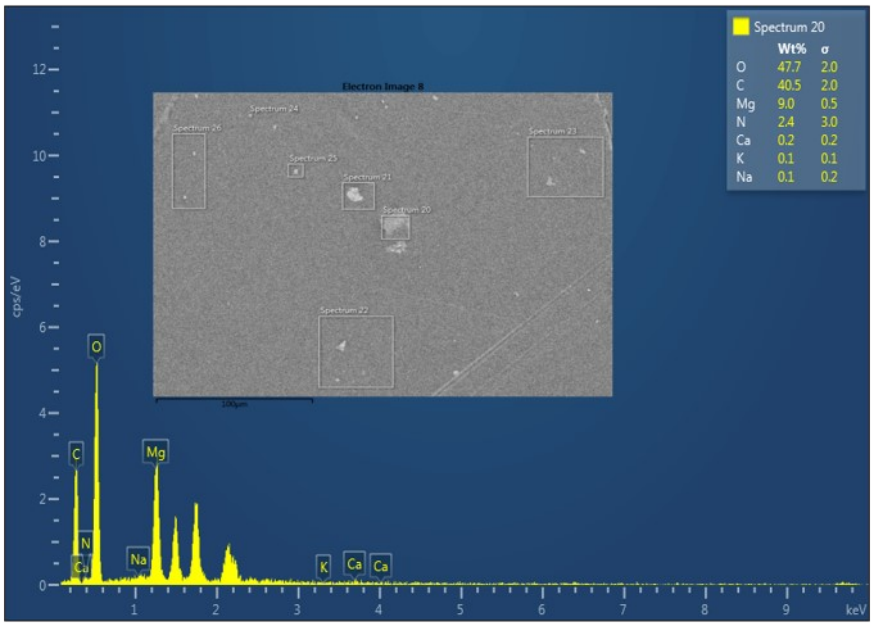

Fig. S5: Energy dispersive X-ray Microscopy image of developed CS/CAEE 28% films

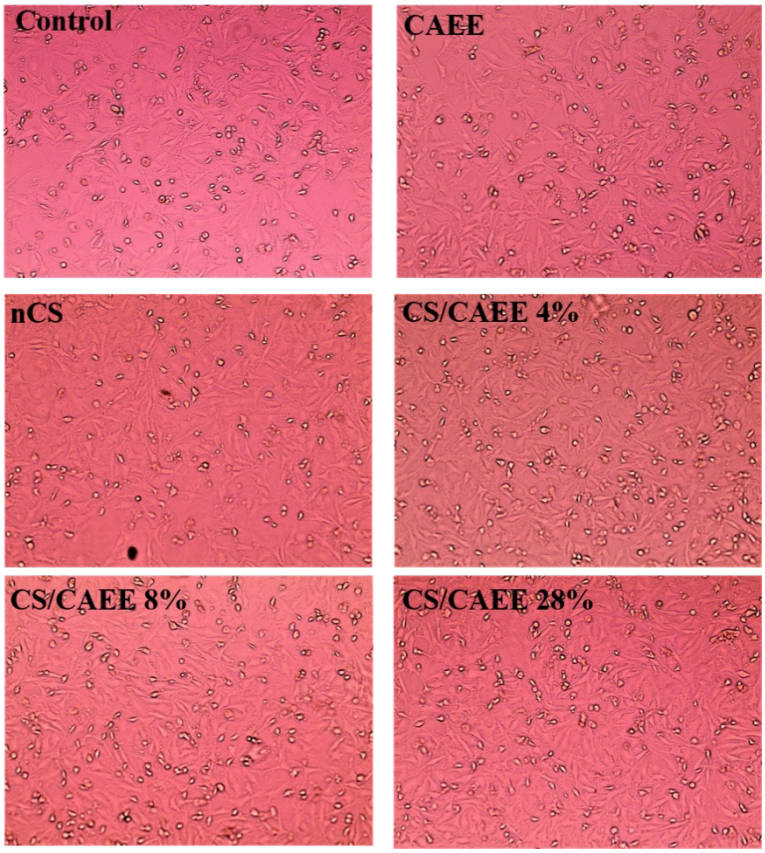

Fig. S6: BHK-21 cell proliferation on control, CAEE, nCS, CS/CAEE 4%, CS/CAEE 8%, and CS/CAEE 28%

Table S1: Color properties of developed CS/CAEE films

Developed Films	**L***	**a***	**b***	**c***
Control	84.93±0.22	-1.556±0.19	25.086±0.68	25.132±0.67
CS/CAEE 4%	82.748±0.56	-2.49±0.15	30.35±1.47	30.452±1.46
CS/CAEE 8%	81.576±0.70	-2.984±0.15	32.25±1.25	32.392±1.23
CS/CAEE 12%	80.54±0.46	-3.298±0.08	34.354±0.50	34.51±0.49
CS/CAEE 16%	75.818±0.40	-2.434±0.19	38.912±0.99	38.99±0.98
CS/CAEE 20%	75.374±0.55	-2.252±0.31	40.096±1.26	40.164±1.24
CS/CAEE 24%	74.57±0.29	-2.062±0.08	41.23±0.32	41.284±0.31
CS/CAEE 28%	70.524±2.22	0.032±0.94	45.162±1.45	45.172±1.44

Table S2: Degradation result of nCS and developed CS/CAEE films at 5% ($T_{5\%}$) and 10% ($T_{10\%}$) weight loss with first and second maximum degradation (T_{max})

Film Sample	$T_{5\%}$ (°C)	$T_{10\%}$ (°C)	First Degradation (T_{max}) (°C)	Second Degradation (T_{max}) (°C)
nCS	71.1±0.17	98.4±0.23	75.46±0.02	308.51±0.12
CS/CAEE 4%	86.5±0.05	124.2±0.17	113.75±0.08	298.39±0.21
CS/CAEE 8%	84.4±0.03	120.3±0.11	113.75±0.16	298.39±0.22
CS/CAEE 12%	87.2±0.25	125.9±0.12	113.75±0.17	295.12±0.05
CS/CAEE 16%	84.4±1.05	118.7±1.19	113.75±0.16	296.02±0.07
CS/CAEE 20%	77.1±1.15	107.4±1.07	76.12±0.14	293.41±0.09
CS/CAEE 24%	84.4±0.05	113.1±0.16	76.12±0.06	292.02±0.13
CS/CAEE 28%	109.7±0.17	156.8±0.07	106.81±0.07	291.36±0.17

Table S3: Antimicrobial activity of developed coating solution

Sample	***Eescherichia coli*** **(Inhibition zone diameter) (cm)**	***Staphylococcus aureus*** **(Inhibition zone diameter) (cm)**
Control (nCS)	0.9±0.09	0.9±0.05
CS/CAEE 4%	1.2±0.14	1.2±0.14
CS/CAEE 28%	1.3±0.05	1.3±0.09

Table S4: Color parameters (*L*, a** & *b**) of coated green chilli with control during storage

Samples	Color parameters	Zero (0^{th}) day	Final (8^{th}) day
Uncoated (Control)	L*	32.69 ± 0.12	46.69 ± 0.18
	a*	-8.77 ± 0.21	4.88 ± 0.28
	b*	18.83 ± 0.12	36.44 ± 0.23
nCS	L*	22.17 ± 0.17	31.17 ± 0.19
	a*	-10.13 ± 0.31	-3.51 ± 0.23
	b*	22.17 ± 0.17	31.17 ± 0.19
CS/CAEE 4%	L*	40.81 ± 0.23	41.35 ± 0.18
	a*	-11.10 ± 0.13	-7.36 ± 0.35
	b*	27.59 ± 0.15	28.82 ± 0.27
CS/CAEE 12%	L*	38.85 ± 0.33	42.59 ± 0.11
	a*	-10.26 ± 0.24	-8.49 ± 0.31
	b*	22.93 ± 0.11	25.19 ± 0.17
CS/CAEE 20%	L*	41.06 ± 0.25	43.79 ± 0.11
	a*	-10.23 ± 0.34	-6.67 ± 0.19
	b*	26.54 ± 0.22	27.28 ± 0.12
CS/CAEE 28%	L*	42.45 ± 0.36	40.32 ± 0.22
	a*	-7.79 ± 0.13	-6.47 ± 0.35
	b*	27.31 ± 0.15	28.542 ± 0.27