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Eco-friendly fabrication of coco coir composites for hydroponic cultivation: A green chemistry approach

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Electronic Supporting Information

Table S1. Description of reactant quantities used for fabricating coco coir composites of different mass ratios of pectin to coco coir.

Mass ratio of pectin to coco coir	Mass of 10 wt.% pectin solution (g)	Mass of pectin in the added 10 wt.% pectin solution (g)	Mass of coco coir (g)
1:5	8	0.8	4
2:5	16	1.6	4
3:5	24	2.4	4
4:5	32	3.2	4
5:5	40	4	4

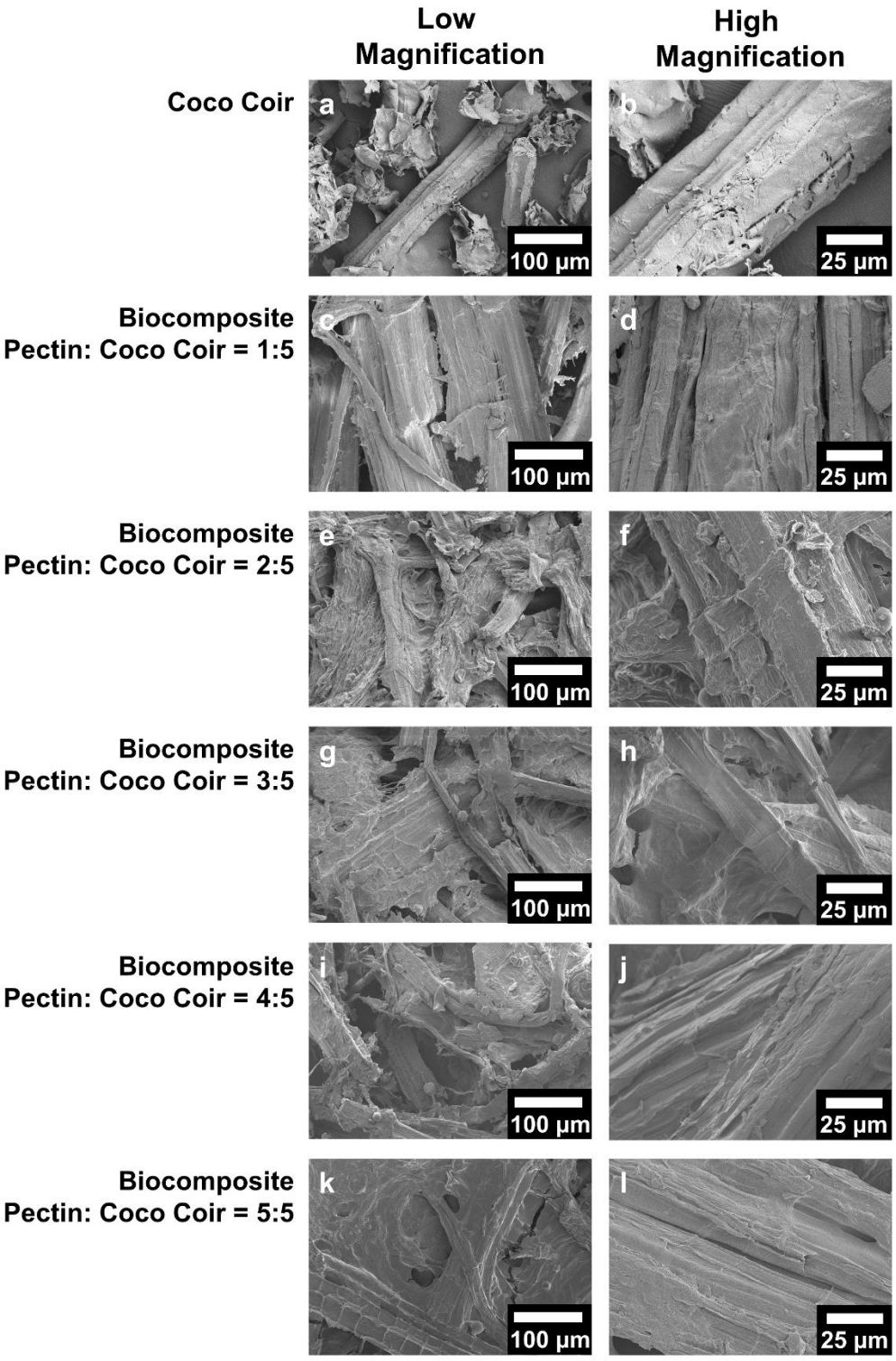

Figure S1. SEM micrographs showing microscopic structures of **(a-b)** coco coir, and biocomposites made using different mass ratios of pectin to coco coir: **(c-d)** 1:5, **(e-f)** 2:5, **(g-h)** 3:5, **(i-j)** 4:5, and **(k-l)** 5:5.

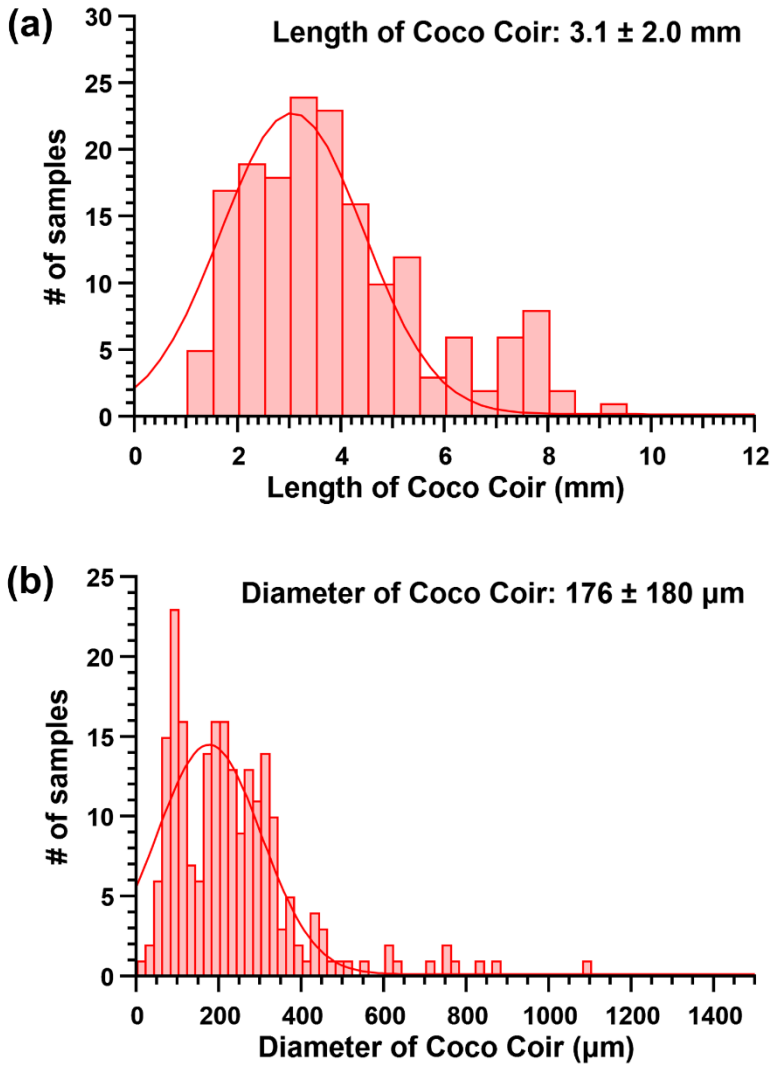

Figure S2. Histograms showing the (a) length distribution and (b) diameter distribution of coco coir.

Table S2. Bulk density of coco coir composites fabricated using different mass ratios of pectin to coco coir expressed as mean value ± one standard deviation (error bar). The superscripted lowercase letters (a - b) assigned to the significantly different mean values ($P < 0.05$) are determined using one-way ANOVA with replication followed by Tukey's HSD (Honest Significant Difference) test.

Mass ratio of pectin to coco coir	Bulk density (g/cm^3)
1:5	0.21 ± 0.01^{b}
2:5	0.22 ± 0.02^{b}
3:5	0.24 ± 0.01^{ab}
4:5	0.26 ± 0.01^{a}
5:5	0.27 ± 0.02^{a}

Table S3. ANOVA (one-factor) results depicting the main and interaction effects of different mass ratios pectin to coco coir on the bulk density of the as-fabricated coco coir composite.

ANOVA results for bulk density						
Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Interaction between mass ratios	57.13	1	57.13	53.31	5.99×10^{-8}	4.19
Within between mass ratios	30.01	28	1.07			
Total	87.14	29				

Table S4. Compressive strength of coco coir composites fabricated using different mass ratios of pectin to coco coir expressed as mean value ± one standard deviation (error bar). The superscripted lowercase letters (a-c) assigned to the significantly different mean values ($P < 0.05$) are determined using one-way ANOVA with replication followed by Tukey's HSD (Honest Significant Difference) test.

Mass ratio of pectin to coco coir	Compressive strength (MPa)
1:5	0.32 ± 0.11^{c}
2:5	0.48 ± 0.10^{c}
3:5	0.62 ± 0.12^{bc}
4:5	0.85 ± 0.11^{ab}
5:5	0.97 ± 0.11^{a}

Table S5. ANOVA results depicting the main and interaction effects of different mass ratios of reactants on the mechanical compressive strength of the as-fabricated coco coir composites.

ANOVA results for mechanical compressive strength						
Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Interaction between mass ratios	41.72	1	41.72	37.68	1.26×10^{-6}	4.19
Within between mass ratios	31.01	28	1.11			
Total	72.72	29				

Table S6. Chemical and physical properties of commercial peat moss and the as-fabricated coco coir composite synthesized using a 2:5 mass ratio of pectin to coco coir.

Material	**Electrical conductivity ($mS\cdot cm^{-1}$)**	**pH**	**Carbon-to-nitrogen ratio**	**Bulk density (g/cm^3)**	**Water retention capacity %**	**Compressive strength (MPa)**
Coco coir composite	1.51	7.5	78.5	0.22	21.6 ± 4.3	0.48
Peat moss[1]	0.05	5.0	14.2	0.21[2]	14.8 ± 2.7	N/A

References

1. A. K. Both, M. A. Helle, G. Madireddy and C. L. Cheung, *ACS Agric. Sci. Technol.*, 2021, **1**, 499-506.
2. D. Stevenson, *Can. J. Soil Sci.*, 1974, **54**, 109-110.