

## Supporting Tables

**Supporting Table S1. ANOVA for yield of dye extracted from *P. perlatum***

Source	Sum of Squares	Mean Square	df	F Value	p-value Prob>F	
Model	15.09	1.68	9	20.42	0.026	Significant
A-Time (min)	3.43	3.43	1	41.20	0.013	
B-Temperature (°C)	2.60	2.60	1	31.66	0.025	
C-Solid to liquid ratio (w/v)	0.12	0.12	1	1.46	0.2806	
AB	0.012	0.012	1	0.15	0.7168	
AC	0.056	0.056	1	6.85	0.0472	
BC	0.13	0.13	1	1.58	0.2645	
A <sup>2</sup>	3.36	3.36	1	40.94	0.0014	
B <sup>2</sup>	3.43	3.43	1	41.81	0.0013	
C <sup>2</sup>	1.25	1.25	1	15.17	0.0115	
Residual	0.41	0.082	5			
Lack of Fit	0.39	0.13	3	10.61	0.0873	Not significant
Pure error	0.024	0.012	2			
Core Total	15.50		14			

**Supporting Table S2. Numerical optimization of processing variables for maximum dye extraction from *P. perlatum* with desirability as a function**

Time (days)	Temperature (°C)	Sample: Liquor ratio (w/v)	Yield (%)	Desirability
30	60	17.91	4.15	0.972

**Supporting Table S3. ANOVA for K/S ratio based on Box-Behnken design for dyeing of silk with extract from *P. perlatum***

<b>Source</b>	<b>Sum of Squares</b>	<b>Mean Square</b>	<b>df</b>	<b>F-Value</b>	<b>p-value Prob&gt;F</b>	
Model	1.63	0.18	9	66.28	0.0001	Significant
A-Temperature	0.37	0.37	1	137.04	<0.0001	
B-Duration	0.017	0.017	1	6.17	0.0556	
C-pH	0.74	0.74	1	270.96	<0.0001	
AB	2.025x10 <sup>-5</sup>	2.025x10 <sup>-5</sup>	1	7.418x10 <sup>-3</sup>	0.9347	
AC	0.038	0.038	1	13.86	0.0137	
BC	0.018	0.018	1	6.78	0.0481	
A <sup>2</sup>	0.21	0.21	1	77.72	0.0003	
B <sup>2</sup>	1.001x10 <sup>-3</sup>	1.001x10 <sup>-3</sup>	1	0.37	0.5713	
C <sup>2</sup>	0.26	0.26	1	93.49	0.0002	
Residual	0.014	2.73x10 <sup>-3</sup>	5			
Lack of Fit	0.014	3.88x10 <sup>-3</sup>	4	34.57	0.1268	Not significant
Pure error	9.8X10 <sup>-5</sup>	9.8x10 <sup>-5</sup>	1			
Core total	1.64		14			

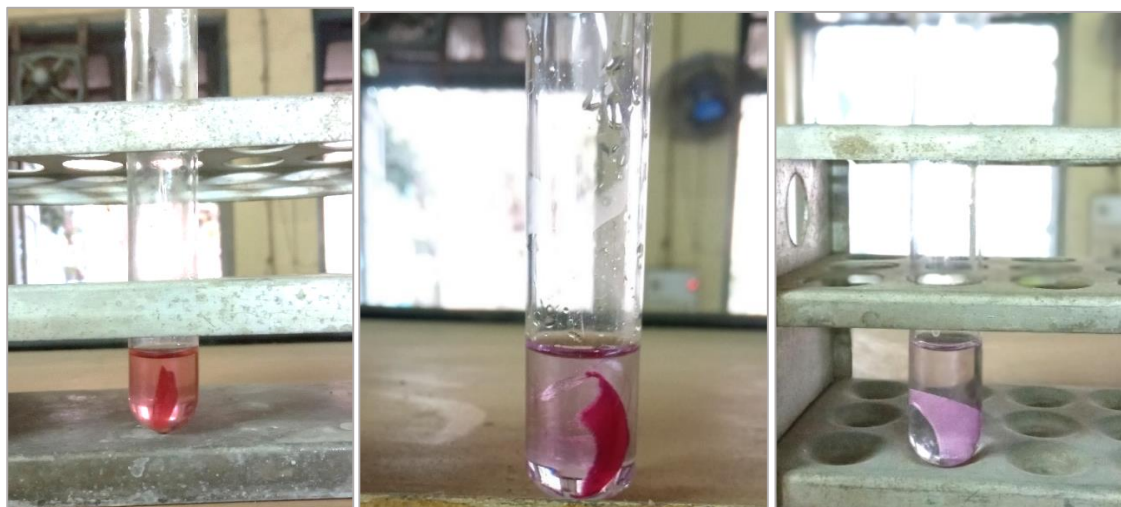
**Supporting Table S4. ANOVA for percent fixation based on Box-Behnken design for dyeing of silk with extract from *P. perlatum***

<b>Source</b>	<b>Sum of Squares</b>	<b>Mean Square</b>	<b>df</b>	<b>F-Value</b>	<b>p-value Prob&gt;F</b>	
Model	1260.80	140.09	9	20.06	0.0021	Significant
A-Temperature	630.97	630.97	1	90.35	0.0002	
B-Duration	96.39	96.39	1	13.80	0.0138	
C-pH	294.67	294.67	1	42.20	0.013	
AB	0.51	0.51	1	0.073	0.7975	
AC	3.93	3.93	1	0.56	0.4872	
BC	2.89	2.89	1	0.41	0.5481	
A <sup>2</sup>	23.26	23.26	1	3.33	0.1276	
B <sup>2</sup>	203.39	203.39	1	29.12	0.0030	
C <sup>2</sup>	29.81	29.81	1	4.27	0.0937	
Residual	34.92	6.98	5			
Lack of Fit	30.40	7.60	4	1.68	0.5161	Not significant
Pure error	4.51	4.51	1			
Core Total	1295.71		14			

**Supporting Table S5. Numerical optimization of parameters for dyeing of silk with extraction from *P. perlatum* with desirability as a function**

<b>Temperature (°C)</b>	<b>Duration (min)</b>	<b>pH</b>	<b>K/S</b>	<b>% Fixation</b>	<b>Desirability</b>
90	60	4.02	1.64	94.65%	0.990

## Supporting Figures



a)

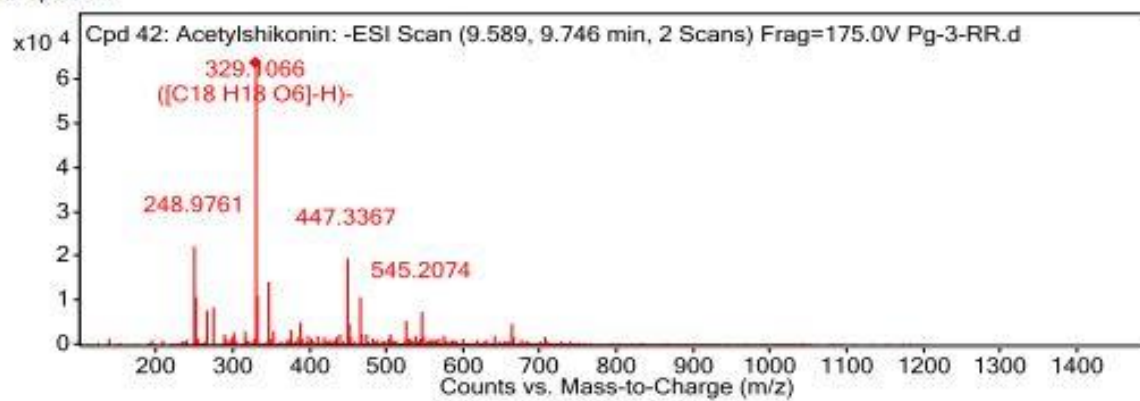
b)

c)

**Supporting Figure S1: Silk fabric dyed with dyes extracted from *P. perlatum* in a) 50% acetic acid, b) 25% pyridine, c) DMF for verification of bonds between dye and the fibre**

Compound Label	Name	<i>m/z</i>	RT	Algorithm	Mass
Cpd 42: Acetylshikonin	Acetylshikonin	329.1066	9.683	Auto MS/MS	330.114

MS Spectrum

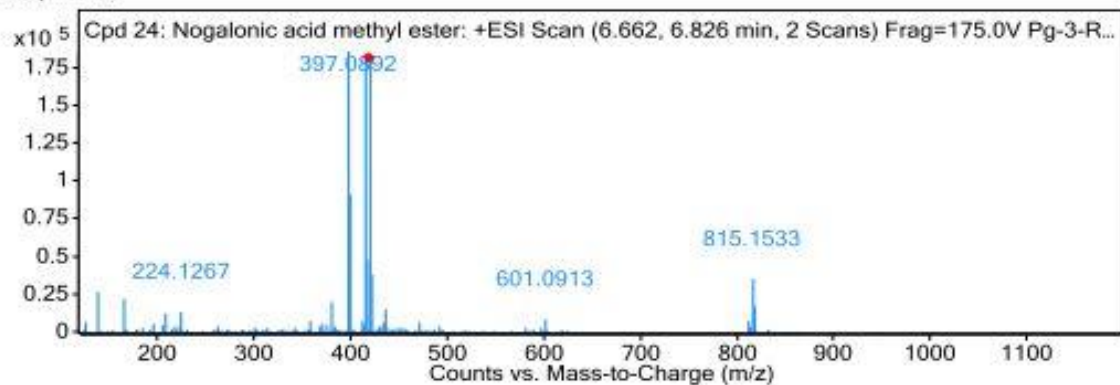


MS Zoomed Spectrum

a)

Compound Label	Name	<i>m/z</i>	RT	Algorithm	Mass
Cpd 24: Nogalonic acid methyl ester	<b>Nogalonic acid methyl ester</b>	419.071	6.772	Auto MS/MS	396.0818

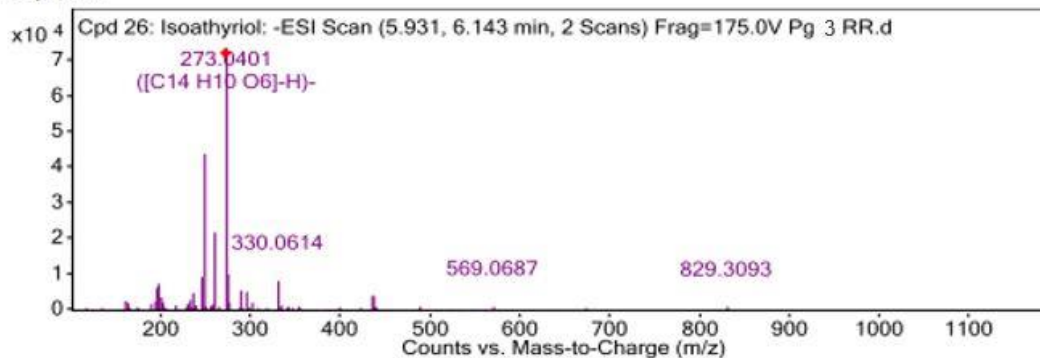
MS Spectrum



b)

Compound Label	Name	<i>m/z</i>	RT	Algorithm	Mass
Cpd 26: Isoathyriol	<b>Isoathyriol</b>	273.0401	6.052	Auto MS/MS	274.0476

MS Spectrum



c)

**Supporting Figure S2: Mass spectrum of the dye extracted from *P. perlatum* showing presence of the chromophores a) acetylshikonin, b) nogalonic acid methyl ester and, c) isoathyriol**