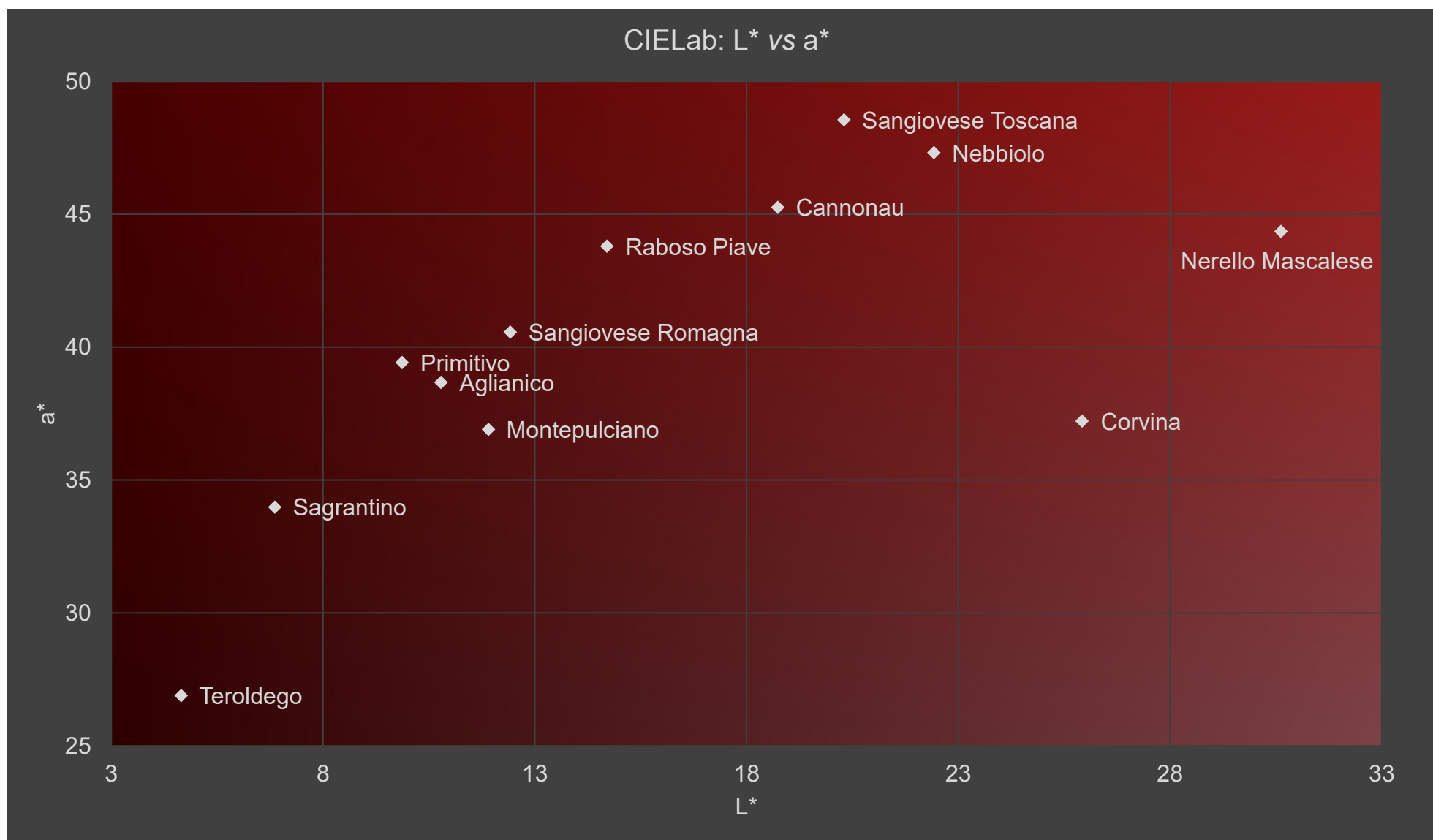


**Figure S1.** Map of Italy with studied monovarietal wines and related administrative regions. *n*: sample-set size for each wine group and region.



**Figure S2.** Scatter plot of average CIELab parameters L\* (clarity) vs a\* (red-green color component) for each wine considered. The background color is meant as an estimation of the wine color, and it was obtained by conversion of CIELab values to RGB values (24-bit color; for this purpose, the b\* integer values of the points close to the bottom-left and top-right angles were used).

**Table S1.** Wine analytical parameters of the 110 monovarietal Italian red wines surveyed.

Wine	<i>n</i>	Alcohol content [% v/v]	Residual reducing sugars [g/L]	Total dry extract [g/L]	Glycerol [g/L]	pH	Titrateable acidity [g/L as tartaric acid]	Volatile acidity [g/L as acetic acid]
Aglianico	10	13.7±0.7 bc	2.8±1.8 ab	35.5±4.6 cd	11.0±1.3 de	3.33±0.25 ab	7.2±0.9 b	0.50±0.09 abc
Cannonau	9	14.7±0.7 cd	2.2±0.7 a	29.1±4.2 ab	10.2±0.9 bcd	3.47±0.18 abc	4.9±0.8 a	0.47±0.07 abc
Corvina	7	12.1±0.7 a	2.1±0.3 a	24.4±2.8 a	7.3±0.9 a	3.40±0.20 abc	5.1±0.7 a	0.53±0.17 bc
Montepulciano	9	13.0±1.1 ab	2.5±0.7 ab	31.6±3.8 bc	9.2±1.1 bc	3.45±0.14 abc	5.4±0.4 a	0.45±0.13 ab
Nebbiolo	11	14.7±0.3 cd	1.7±0.3 a	28.0±1.8 ab	10.0±0.7 bcd	3.46±0.08 abc	5.5±0.5 a	0.64±0.07 cd
Nerello Mascalese	3	13.0±0.9 ab	1.1±0.1 a	28.0±2.4 ab	9.0±0.9 abc	3.59±0.15 bc	5.3±1.0 a	0.38±0.07 ab
Primitivo	11	15.4±0.9 d	5.4±5.1 b	40.8±6.1 d	12.7±1.6 e	3.33±0.12 ab	7.0±1.1 b	0.52±0.17 bc
Raboso Piave	10	13.1±0.7 ab	3.1±1.3 ab	33.2±5.6 bc	8.5±1.3 ab	3.30±0.17 a	7.7±1.4 b	0.44±0.07 ab
Sagrantino	10	14.9±0.8 cd	2.5±1.2 ab	33.7±2.4 bc	10.3±0.8 cd	3.63±0.19 c	5.1±0.9 a	0.73±0.09 d
Sangiovese Romagna	12	14.1±0.7 bc	1.8±0.5 a	28.1±2.5 ab	9.2±0.9 bc	3.50±0.13 abc	5.3±0.6 a	0.49±0.14 abc
Sangiovese Toscana	7	13.4±1.1 b	1.8±0.2 a	28.3±1.3 ab	8.9±0.9 abc	3.34±0.15 ab	5.1±0.3 a	0.32±0.05 a
Teroldego	11	13.3±0.4 ab	1.9±0.3 a	31.5±1.5 bc	9.4±0.7 bcd	3.62±0.19 c	5.1±0.5 a	0.44±0.07 ab
Total	110	13.9±1.2	2.5±2.0	31.5±5.5	9.8±1.6	3.45±0.19	5.8±1.2	0.50±0.14

Data is expressed as average value ± standard deviation. *n*: number of samples for each variety. All parameters evidenced significant differences at  $p < 0.001$  (ANOVA) among values within the same column. Different Latin letters within the same column refer to significant differences among varieties according to Tukey HSD test ( $p < 0.05$ ).

**Table S2.** Pearson correlation coefficients (r) between base parameters across the 110 monovarietal Italian red wines surveyed.

	Alcohol [% v/v]	Residual reducing sugars [g/L]	Total dry extract [g/L]	Dry net extract [g/L]	Glycerol [g/L]	pH	Titrateable acidity [g tartaric acid/L]	Volatile acidity [g acetic acid/L]	Buffer capacity [meq/pH unit]
Alcohol [% v/v]									
Residual reducing sugars [g/L]	<u>0.23</u>								
Total dry extract [g/L]	<b>0.36</b>	<b>0.54</b>							
Dry net extract [g/L]	<b>0.32</b>	<u>0.20</u>	<b>0.93</b>						
Glycerol [g/L]	<b>0.68</b>	<b>0.34</b>	<b>0.69</b>	<b>0.65</b>					
pH	0.13	-0.08	0.01	0.05	0.04				
Titrateable acidity [g tartaric acid/L]	0.01	<b>0.32</b>	<b>0.60</b>	<b>0.56</b>	<b>0.32</b>	<b>-0.46</b>			
Volatile acidity [g acetic acid/L]	<b>0.31</b>	0.10	0.13	0.11	0.12	0.18	-0.06		
Buffer capacity [meq/pH unit]	0.02	<u>0.22</u>	<b>0.50</b>	<b>0.48</b>	<b>0.28</b>	<b>-0.25</b>	<b>0.76</b>	-0.06	

Significant values at  $p < 0.05$  and  $0.01$  are shown as underlined and bold font, respectively.

**Table S3.** Wine phenolic composition parameters of the 110 monovarietal Italian red wines surveyed.

Wine	<i>n</i>	Total phenols (Folin-Ciocalteu) [mg (+)-catechin/L]	Methyl cellulose precipitable (MCP) tannin assay [mg (+)- catechin/L]	Proanthocyanidins assay [mg cyanidin chloride/L]	Vanillin assay [mg (+)-catechin/L]	Total anthocyanins index [mg malvidin-3-O- glucoside chloride/L]	Monomeric anthocyanins index [mg malvidin-3-O- glucoside chloride/L]	% Monomeric/Total anthocyanins*
Aglianico	10	3053±961 cd	2043±506 c	3729±1078 bc	2024±980 c	337±85 c	192±51 d	59±17 d
Cannonau	9	1965±655 ab	1615±547 bc	2904±890 b	1230±564 ab	213±59 abc	125±44 bcd	58±7 cd
Corvina	7	1065±417 a	533±319 a	1309±538 a	528±253 a	109±36 a	51±15 ab	48±8 abcd
Montepulciano	9	1978±718 ab	1341±468 b	2942±1210 b	1012±368 ab	255±111 abc	104±39 abc	42±6 abcd
Nebbiolo	11	2841±348 bcd	1716±103 bc	4625±532 cd	2037±169 c	110±17 a	43±16 a	38±11 abc
Nerello Mascalese	3	2033±169 b	1519±153 bc	3579±284 bc	1495±26 bc	145±48 ab	77±27 abc	53±3 bcd
Primitivo	11	2444±267 bc	1908±196 bc	3240±487 ab	1107±244 ab	245±70 abc	95±51 abc	37±12 ab
Raboso Piave	10	2497±606 bc	1469±342 bc	3772±1147 bc	1366±469 bc	305±135 bc	178±80 d	60±23 d
Sagrantino	10	3578±468 d	2965±498 d	5371±600 d	2942±517 c	228±46 abc	75±26 abc	33±10 a
Sangiovese Romagna	12	2202±646 bc	1835±530 bc	3618±815 bc	1421±382 bc	252±48 abc	127±26 cd	51±8 abcd
Sangiovese Toscana	7	1945±381 ab	1723±218 bc	3508±532 bc	1439±186 bc	227±39 abc	133±17 cd	59±4 d
Teroldego	11	2378±384 bc	1584±355 bc	2795±542 ab	975±225 ab	702±227 d	315±59 e	47±10 abcd
Total	110	2406±799	1737±641	3513±1207	1492±750	276±184	132±86	48±15

Data is expressed as average value ± standard deviation. *n*: number of samples for each variety. All parameters evidenced significant differences at  $p < 0.001$  (ANOVA) among values within the same column. Different Latin letters within the same column refer to significant differences among varieties according to Tukey HSD test ( $p < 0.05$ ). \*Calculated considering the percentage values of each sample.

**Table S4.** Pearson correlation coefficients (r) between phenolic indices gathered across the 110 monovarietal Italian red wines surveyed.

	Total phenols (Folin-Ciocalteu) [mg (+)-catechin/L]	Phenolics-Fe [mg/L]	Tannins-Fe [mg/L]	Total flavonoids index [mg (+)-catechin/L]	Methyl cellulose precipitable (MCP) tannin assay [mg (+)-catechin/L]	Proanthocyanidins assay [mg cyanidin chloride/L]	Vanillin assay [mg (+)-catechin/L]	ABTS [%]	Absorbance at 230nm [AU]	Absorbance at 280nm [AU]	Total anthocyanins index [mg malvidin-3-O-glucoside chloride/L]	Monomeric anthocyanins index [mg malvidin-3-O-glucoside chloride/L]
Total phenols (Folin-Ciocalteu) [mg (+)-catechin/L]												
Phenolics-Fe [mg/L]	<b>0.86</b>											
Tannins-Fe [mg/L]	<b>0.79</b>	<b>0.92</b>										
Total flavonoids index [mg (+)-catechin/L]	<b>0.90</b>	<b>0.82</b>	<b>0.70</b>									
Methyl cellulose precipitable (MCP) tannin assay [mg (+)-catechin/L]	<b>0.80</b>	<b>0.82</b>	<b>0.78</b>	<b>0.74</b>								
Proanthocyanidins assay [mg cyanidin chloride/L]	<b>0.86</b>	<b>0.91</b>	<b>0.90</b>	<b>0.78</b>	<b>0.78</b>							
Vanillin assay [mg (+)-catechin/L]	<b>0.86</b>	<b>0.95</b>	<b>0.91</b>	<b>0.83</b>	<b>0.78</b>	<b>0.89</b>						
ABTS [%]	<b>0.80</b>	<b>0.73</b>	<b>0.70</b>	<b>0.72</b>	<b>0.81</b>	<b>0.78</b>	<b>0.69</b>					
Absorbance at 230nm [AU]	<b>0.63</b>	<b>0.63</b>	<b>0.46</b>	<b>0.65</b>	<b>0.62</b>	<b>0.56</b>	<b>0.61</b>	<b>0.46</b>				
Absorbance at 280nm [AU]	<b>0.91</b>	<b>0.82</b>	<b>0.68</b>	<b>0.93</b>	<b>0.83</b>	<b>0.80</b>	<b>0.78</b>	<b>0.81</b>	<b>0.76</b>			
Total anthocyanins index [mg malvidin-3-O-glucoside chloride/L]	<u>0.24</u>	-0.04	-0.16	<b>0.35</b>	0.16	0.06	-0.03	<b>0.27</b>	<b>0.35</b>	<b>0.43</b>		
Monomeric anthocyanins index [mg malvidin-3-O-glucoside chloride/L]	0.14	-0.14	<b>-0.26</b>	<u>0.21</u>	0.01	0.05	-0.11	<u>0.21</u>	0.16	<b>0.27</b>	<b>0.90</b>	

Significant values at  $p < 0.05$  and  $0.01$  are shown as underlined and bold font, respectively.

**Table S5.** Wine color parameters of the 110 monovarietal Italian red wines surveyed.

Wine	<i>n</i>	L*	a*	b*	C*	H*	Color intensity [AU]	Polymeric color [AU]	Copigmentation [AU]	Absorbance at 520 nm [AU]	Color hue (420 nm/520 nm)
Aglianico	10	10.8±5.8 abcd	38.67±8.31 bcd	17.99±8.93 abc	42.91±11.13 bcd	23.43±6.78 abc	11.84±4.49 cd	2.54±1.05 bcd	2.00±0.74 cd	6.57±2.66 de	0.63±0.09 a
Cannonau	9	18.7±7.0 cdef	45.26±4.19 cd	27.16±6.84 cde	52.94±6.73 cde	30.45±5.11 cdef	6.61±2.34 abc	1.37±0.34 ab	1.02±0.39 abc	3.52±1.47 abcd	0.71±0.12 a
Corvina	7	25.9±10.0 fg	37.23±6.01 abc	31.77±6.15 de	49.35±5.13 bcde	40.45±8.01 g	4.02±1.33 a	1.19±0.50 ab	0.35±0.31 a	1.78±0.69 a	1.05±0.31 d
Montepulciano	9	11.9±7.9 abcd	36.91±10.39 abc	19.06±11.07 abc	41.93±13.93 abc	24.91±8.73 abcd	10.01±5.61 bcd	2.34±1.38 bcd	0.95±0.69 abc	5.10±3.09 bcde	0.76±0.09 ab
Nebbiolo	11	22.4±3.2 efg	47.32±1.57 cd	34.23±2.83 e	58.43±2.50 e	35.83±2.03 efg	5.52±0.77 ab	1.45±0.46 ab	0.57±0.16 ab	2.54±0.42 ab	0.97±0.17 bcd
Nerello Mascalese	3	30.6±10.0 g	44.35±7.80 bcd	35.09±2.22 e	56.68±6.75 de	38.65±4.64 fg	4.07±1.33 a	0.78±0.17 a	0.94±0.15 abc	1.91±0.73 a	1.00±0.23 cd
Primitivo	11	9.9±2.7 abc	39.42±3.07 bcd	16.89±4.51 abc	42.98±4.55 bcd	22.80±4.06 abc	10.28±1.60 bcd	2.91±0.87 cd	1.20±0.49 abc	5.31±1.00 bcde	0.71±0.11 a
Raboso Piave	10	14.7±8.1 bcde	43.80±6.24 bcd	23.70±10.32 cde	50.12±10.44 cde	27.15±6.93 bcde	11.9±4.75 cd	2.17±1.05 bc	1.63±0.75 bcd	6.90±2.94 e	0.59±0.08 a
Sagrantino	10	6.9±2.4 ab	33.99±4.96 ab	11.81±4.07 ab	36.04±5.99 ab	18.63±3.66 ab	12.1±2.98 cd	3.06±0.99 cd	1.47±0.67 abcd	6.03±1.86 cde	0.79±0.11 abc
Sangiovese Romagna	12	12.4±6.1 abcd	40.57±6.55 bcd	20.25±8.49 bcd	45.59±9.51 bcde	25.30±6.49 bcd	9.68±3.17 bcd	1.78±0.55 abc	1.15±0.37 abc	5.10±1.79 bcde	0.71±0.10 a
Sangiovese Toscana	7	20.3±4.1 def	48.55±2.37 d	31.79±4.55 de	58.08±4.36 e	33.05±2.74 def	6.29±1.27 ab	1.23±0.22 ab	1.31±0.25 abcd	3.18±0.71 abc	0.80±0.08 abc
Teroldego	11	4.6±2.3 a	26.90±8.49 a	8.01±4.01 a	28.10±9.27 a	15.82±2.89 a	14.82±3.21 cd	3.57±0.81 d	2.55±1.74 d	7.59±1.88 e	0.70±0.07 a
Total	110	14.3±8.7	39.73±8.49	21.75±10.62	45.76±11.9	26.75±8.78	9.50±4.44	2.17±1.11	1.31±0.92	4.95±2.56	0.76±0.18

Data is expressed as average value ± standard deviation. *n*: number of samples for each variety. All parameters evidenced significant differences at  $p < 0.001$  (ANOVA) among values within the same column. Different Latin letters within the same column refer to significant differences among varieties according to Tukey HSD test ( $p < 0.05$ ). Absorbance unit [AU] values are expressed on a 10 mm optical path length. L\*, lightness; a\*, red-green color coordinate; b\*, yellow-blue color coordinate; C\*, chroma; H\*, hue angle.

**Table S6.** Pearson correlation coefficients (r) between anthocyanin and color parameters of the 110 monovarietal Italian red wines surveyed.

	Total anthocyanins index [mg malvidin-3-O-glucoside chloride/L]	Monomeric anthocyanins index [mg malvidin-3-O-glucoside chloride/L]	L*	a*	b*	C*	H*	Color hue	Absorbance at 520 nm [AU]	Color intensity [AU]	Copigmentation [AU]	Polymeric color [AU]	LPP [% on polymeric pigments]
Total anthocyanins index [mg malvidin-3-O-glucoside chloride/L]													
Monomeric anthocyanins index [mg malvidin-3-O-glucoside chloride/L]	<b>0.90</b>												
L*	<b>-0.61</b>	<b>-0.47</b>											
a*	<b>-0.66</b>	<b>-0.43</b>	<b>0.65</b>										
b*	<b>-0.66</b>	<b>-0.49</b>	<b>0.95</b>	<b>0.82</b>									
C*	<b>-0.69</b>	<b>-0.48</b>	<b>0.83</b>	<b>0.96</b>	<b>0.95</b>								
H*	<b>-0.66</b>	<b>-0.50</b>	<b>0.96</b>	<b>0.70</b>	<b>0.97</b>	<b>0.86</b>							
Color hue	<b>-0.43</b>	<b>-0.43</b>	<b>0.64</b>	0.17	<b>0.55</b>	<b>0.37</b>	<b>0.66</b>						
Absorbance at 520 nm [AU]	<b>0.70</b>	<b>0.57</b>	<b>-0.83</b>	<b>-0.72</b>	<b>-0.87</b>	<b>-0.82</b>	<b>-0.87</b>	<b>-0.68</b>					
Color intensity [AU]	<b>0.72</b>	<b>0.56</b>	<b>-0.87</b>	<b>-0.78</b>	<b>-0.91</b>	<b>-0.88</b>	<b>-0.90</b>	<b>-0.61</b>	<b>0.99</b>				
Copigmentation [AU]	<b>0.72</b>	<b>0.69</b>	<b>-0.48</b>	<b>-0.38</b>	<b>-0.48</b>	<b>-0.45</b>	<b>-0.50</b>	<b>-0.37</b>	<b>0.53</b>	<b>0.54</b>			
Polymeric color [AU]	<b>0.62</b>	<b>0.42</b>	<b>-0.81</b>	<b>-0.76</b>	<b>-0.85</b>	<b>-0.84</b>	<b>-0.84</b>	<b>-0.46</b>	<b>0.85</b>	<b>0.89</b>	<b>0.45</b>		
LPP [% on polymeric pigments]	<b>0.54</b>	<b>0.53</b>	<b>-0.18</b>	<b>-0.46</b>	<b>-0.31</b>	<b>-0.40</b>	<b>-0.23</b>	0.04	<b>0.25</b>	<b>0.27</b>	<b>0.35</b>	<b>0.28</b>	

Significant values at  $p < 0.05$  and  $0.01$  are shown as underlined and bold font, respectively.