

RESULTS

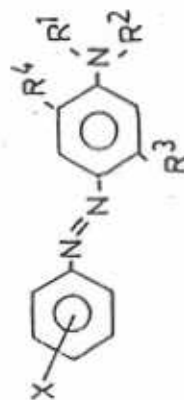
All the experimental data have been tabulated and are given below.

Tables 15-28 show the UV/visible absorption spectral data of all the dyestuffs which have been prepared, in neutral and acidic or alkaline solution. The disperse dyes prepared by coupling with substituted aniline and acid dyes synthesized by coupling with substituted naphthol sulphonic acid showed a marked difference in their absorption maxima in acidic solution so, their absorption was also recorded in acidic solution.

On the other hand, dyes from naphthols, phenol, p-cresol and salicylic acid showed a considerable change in their absorption maxima in alkaline media. Therefore, their visible spectra were also recorded in alkaline media.

Table. 15

UV/visible absorption spectra of dyestuffs from mono substituted diazo components coupled with substituted anilines, recorded in neutral and acidified alcoholic solution.



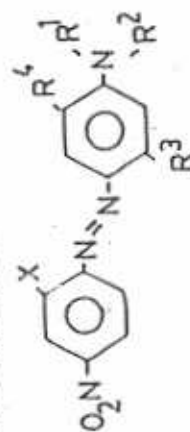
Dye Ref. No.	X	R ¹	R ²	R ³	R ⁴	In neutral soln.		After protonation	
						λ_{max} (nm)	ϵ_{max}	λ_{max} (nm)	ϵ_{max}
A-1	H	Et	C ₂ H ₄ OH	H	H	415	22838	520	25473
B-1	4-CN	"	"	"	"	464	32206	514	52206
C-1	3-CN	"	"	"	"	445	36765	507	41176
D-1	2-CN	"	"	"	"	460	16667	514	3922
A-2	H	C ₂ H ₄ OCOCH ₃	C ₂ H ₄ OCOCH ₃	NHCOCH ₃	H	418	27419	465	19194
B-2	4-CN	"	"	"	"	472	38065	478	23656
C-2	3-CN	"	"	"	"	455	27350	468	17009
D-2	2-CN	"	"	"	"	473	22857	478	15000
A-3	H	CH ₃	C ₂ H ₄ CN	H	H	397	1606	525	2310
B-3	4-CN	"	"	"	"	435	32246	514	71739
C-3	3-CN	"	"	"	"	417	28986	516	58406
D-3	2-CN	"	"	"	"	432	32524	514	69903
A-4	H	Et	C ₂ H ₄ OH	CH ₃	H	418	13636	515	23011
B-4	4-CN	"	"	"	"	476	33765	510	59877
C-4	3-CN	"	"	"	"	444	27907	504	41860
D-4	2-CN	"	"	"	"	458	11883	500	5586
A-5	H	C ₂ H ₄ OCOCH ₃	C ₂ H ₄ OCOCH ₃	H	H	403	18298	523	18617

(cont.)

Dye Ref. No.	R ¹ R ² R ³ R ⁴				In neutral soln.		After protonation		
	X	R ¹	R ²	R ³	R ⁴	λ_{\max} (nm)	ϵ_{\max}	λ_{\max} (nm)	ϵ_{\max}
B-5	4-CN	"	"	"	"	440	27778	516	56481
C-5	3-CN	"	"	"	"	420	31481	510	60185
D-5	2-CN	"	"	"	"	436	29012	519	30247
A-6	H	C ₂ H ₅ OCOCH ₃	C ₂ H ₅ OCOCH ₃	CH ₃	H	398	21954	525	36588
B-6	4-CN	"	"	"	"	444	31731	519	63462
C-6	3-CN	"	"	"	"	423	35889	512	50091
D-6	2-CN	"	"	"	"	440	16103	519	14852
A-7	H	C ₂ H ₅ OCOCH ₃	C ₂ H ₅ OCOCH ₃	NHCOCH ₃	OCH ₃	438	10217	452	10464
B-7	4-CN	"	"	"	"	490	20611	460	17557
C-7	3-CN	"	"	"	"	473	15596	460	12844
D-7	2-CN	"	"	"	"	497	17431	460	9174
A-8	H	C ₂ H ₅ CN	C ₂ H ₅ OCOCH ₃	H	H	397	9562	525	17504
B-8	4-CN	"	"	"	"	432	30702	538	66667
C-8	3-CN	"	"	"	"	412	34211	531	60526
D-8	2-CN	"	"	"	"	427	41930	507	38246
A-9	H	C ₂ H ₅ OH	C ₂ H ₅ CN	H	H			No Peak	
B-9	4-CN	"	"	"	"	439	32061	516	70229
C-9	3-CN	"	"	"	"	418	28244	510	54045
D-9	2-CN	"	"	"	"	434	17791	510	17791

Table. 16

Visible absorption spectra of dyestuffs form disubstituted diazo components coupled with substituted anilines, recorded in neutral and acidified alcoholic solution.



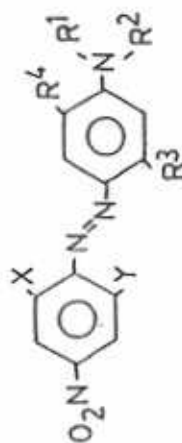
Dye Ref. No.	X	R ¹	R ²	R ³	R ⁴	In neutral soln.		After protonation	
						λ_{\max} (nm)	ϵ_{\max}	λ_{\max} (nm)	ϵ_{\max}
E-1	H	Et	C ₂ H ₄ OH	H	H	488	38583	515	71260
F-1	CN	"	"	"	"	540	34188	502	27350
E-2	H	C ₂ H ₄ OCOCH ₃	C ₂ H ₄ OCOCH ₃	NHCOCH ₃	H	490	36180	507	39326
F-2	CN	"	"	"	"	522	29528	507	33071
E-3	H	CH ₃	C ₂ H ₄ CN	H	H	455	34109	538	82946
F-3	CN	"	"	"	"	504	18436	513	25698
E-4	H	Et	C ₂ H ₄ OH	CH ₃	H	498	38843	513	79572
F-4	CN	"	"	"	"	542	31548	513	46429
E-5	H	C ₂ H ₄ OCOCH ₃	C ₂ H ₄ OCOCH ₃	H	H	460	30392	540	76961
F-5	CN	"	"	"	"	508	16667	518	22917
E-6	H	C ₂ H ₄ OCOCH ₃	C ₂ H ₄ OCOCH ₃	CH ₃	H	469	26016	535	61789
F-6	CN	"	"	"	"	512	17266	520	33813
E-7	H	C ₂ H ₄ OCOCH ₃	C ₂ H ₄ OCOCH ₃	NHCOCH ₃	OCH ₃	507	26240	530	40400
F-7	CN	"	"	"	"	558	26891	515	33613

(cont.)

Dye Ref. No.	X	R ¹	R ²	R ³	R ⁴	In neutral soln.		After protonation	
						λ_{max} (nm)	ϵ_{max}	λ_{max} (nm)	ϵ_{max}
E-8	H	C ₂ H ₅ CN	C ₂ H ₄ OCOCH ₃	H	H	450	32407	543	85185
F-8	CN	"	"	-	"	490	18421	525	28947
E-9	H	C ₂ H ₅ OH	C ₂ H ₄ CN	H	H	457	30894	542	72358
F-9	CN	"	"	-	"	500	30702	530	54825

Table. 17

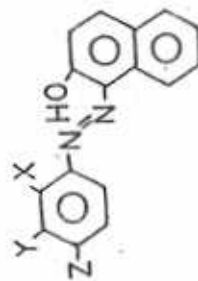
Visible absorption spectra of dyestuffs from trisubstituted diazo components coupled with substituted anilines, recorded in DMF.



Dye Ref. No.	X	Y	R ¹	R ²	R ³	R ⁴	λ_{\max} (nm)	ϵ_{\max}
G-1	Br	Br	Et	C ₂ H ₄ OH	H	H	446	16194
G-1A	CN	CN	"	"	"	"	583	33029
G-2	Br	Br	C ₃ H ₇ OCOCH ₃	C ₂ H ₅ OCOCH ₃	NHCOCH ₃	H	475	14545
G-2A	CN	CN	"	"	"	"	595	28423
G-3	Br	Br	CH ₃	C ₂ H ₄ CN	H	H	430	17407
G-3A	CN	CN	"	"	"	"	549	25269
G-4	Br	Br	Et	C ₂ H ₄ OH	CH ₃	H	429	15815
G-4A	CN	CN	"	"	"	"	610	37689

Table. 18

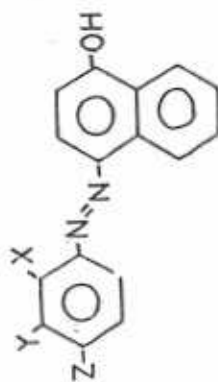
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with β -naphthol, recorded in neutral and alkaline alcoholic solution.



Dye Ref. No.	X	Y	Z	In neutral soln.		In alkaline soln.	
				λ_{max} (nm)	ϵ_{max}	λ_{max} (nm)	ϵ_{max}
A-10	H	H	H	432	13900	483	16183
B-10	H	H	CN	480	16644	No Change	16438
C-10	H	CN	H	473	11096	462	9132
D-10	CN	H	H	478	15525	488	16438
E-10	H	H	NO ₂	485	7625	555	4707
F-10	CN	H	NO ₂	480	7325	587	10828

Table. 19

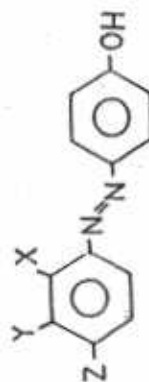
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with α -naphthol, recorded in neutral and alkaline alcoholic solution.



Dye Ref. No.	X	Y	Z	In neutral soln.		In alkaline soln.	
				λ_{max} (nm)	ϵ_{max}	λ_{max} (nm)	ϵ_{max}
A-II	H	H	H	i) 474 ii) 407	35062 37344	502	23651
B-II	H	H	CN	460	21585	555	28962
C-II	H	CN	H	455	20548	528	30137
D-II	CN	H	H	442	5464	537	19126
E-II	H	H	NO ₂	472	20098	605	21569
F-II	CN	H	NO ₂	465	16000	628	27200

Table. 20

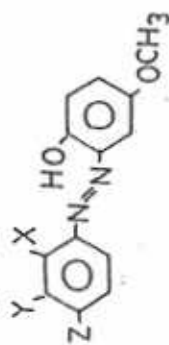
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with phenol, recorded in neutral and alkaline alcoholic solution.



Dye Ref. Nos.	X	Y	Z	In neutral soln.		In alkaline soln.	
				λ_{\max} (nm)	ϵ_{\max}	λ_{\max} (nm)	ϵ_{\max}
A-19	H	H	H	349	23020	408	23267
B-19	H	H	CN	367	29218	475	34525
C-19	H	CN	H	360	27933	450	31006
D-19	CN	H	H	368	20112	462	24581
E-19	H	H	NO ₂	380	39024	505	51219
F-19	CN	H	NO ₂	398	20469	555	34899

Table. 21

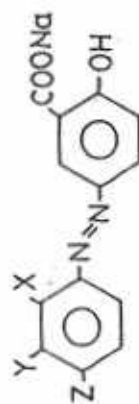
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with *p*-cresol, recorded in neutral and alkaline alcoholic solution.



Dye Ref. No.	X	Y	Z	In neutral soln.		In alkaline soln.	
				λ_{\max} (nm)	ϵ_{\max}	λ_{\max} (nm)	ϵ_{\max}
A-20	H	H	H	388	6794	484	7219
B-20	H	H	CN	405	14108	567	18880
C-20	H	CN	H	397	8670	504	11995
D-20	CN	H	H	414	6532	512	9264
E-20	H	H	NO ₂	415	11348	553	17745
F-20	CN	H	NO ₂	360	5642	602	1982

Table. 22

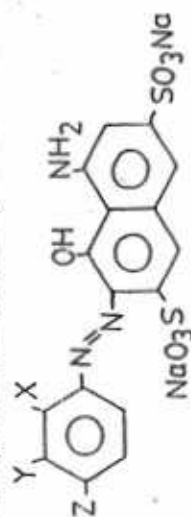
Visible absorption spectra of dyestuffs from mono and disubstituted diazo components coupled with salicylic acid, recorded in aqueous and alkaline aqueous solution.



Dye Ref. No.	X	Y	Z	In aqueous soln.	
				λ_{\max} (nm)	λ_{\max} (nm)
A-12	H	H	H	350	371
B-12	H	H	CN	365	410
C-12	H	CN	H	352	391
D-12	CN	H	H	364	405
E-12	H	H	NO ₂	375	440
F-12	CN	H	NO ₂	362	485

Table. 23

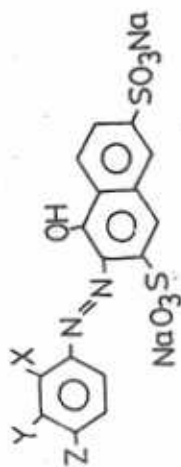
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with H- acid, recorded in aqueous and acidified aqueous solution.



Dye Ref. No.	X	Y	Z	In aqueous soln.	
				λ_{max} (nm)	λ_{max} (nm)
A-13	H	H	H	426	424
B-13	H	H	CN	530	517
C-13	H	CN	H	525	518
D-13	CN	H	H	540	520
E-13	H	H	NO ₂	540	528
F-13	CN	H	NO ₂	600	526

Table. 24

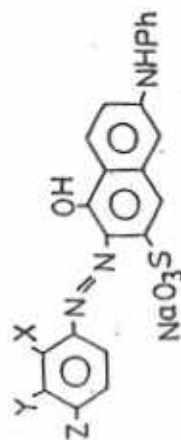
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with 1-naphthol-3,6-disulfonic acid, recorded in aqueous and acidified aqueous solution.



Dye Ref. No.	X	Y	Z	In aqueous soln.	
				λ_{max} (nm)	λ_{max} (nm)
A-14	H	H	H	490	488
B-14	H	H	CN	488	488
C-14	H	CN	H	483	483
D-14	CN	H	H	490	490
E-14	H	H	NO ₂	500	490
F-14	CN	H	NO ₂	i) 513 ii) 573	472

Table. 25

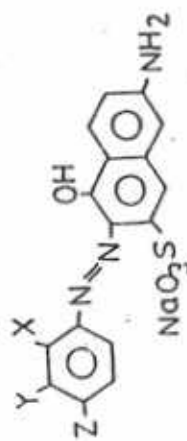
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with N-phenyl-J- acid, recorded in aqueous and acidified aqueous solution.



Dye Ref. No.	X	Y	Z	In aqueous soln.	
				λ_{max} (nm)	λ_{max} (nm)
A-15	H	H	H	494	490
B-15	H	H	CN	488	482
C-15	H	CN	H	498	495
D-15	CN	H	H	484	480
E-15	H	H	NO ₂	481	485
F-15	CN	H	NO ₂	495	468

Tabel. 26

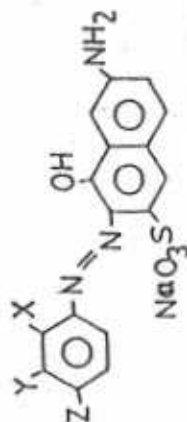
Visible absorption spectra of dyestuffs from mono and disubstituted diazo components coupled with *p*-acid, recorded in aqueous and acidified aqueous solution.



Dye Ref. No.	X	Y	Z	In aqueous soln.	
				λ_{max} (nm)	λ_{max} (nm)
A-16	H	H	H	478	485
B-16	H	H	CN	485	480
C-16	H	CN	H	470	473
D-16	CN	H	H	503	499
E-16	H	H	NO ₂	495	490
F-16	CN	H	NO ₂	487	473

Table. 27

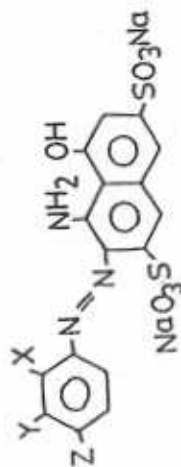
Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with Gamma acid, recorded in aqueous and acidified aqueous solution.



Dye Ref.	X	Y	Z	In aqueous soln.	
				λ_{max} (nm)	λ_{max} (nm)
A-17	H	H	H	510	488
B-17	H	H	CN	503	498
C-17	H	CN	H	465	485
D-17	CN	H	H	507	496
E-17	H	H	NO ₂	503	475
F-17	CN	H	NO ₂	532	478

Table. 28

Visible absorption spectra of dyestuffs form mono and disubstituted diazo components coupled with H- acid(in acid media), recorded in aqueous and acidified aqueous solution.



Dye Ref. No.	X	Y	Z	In aqueous soln.	
				λ_{max} (nm)	λ_{max} (nm)
A-18	H	H	H	525	525
B-18	H	H	CN	549	520
C-18	H	CN	H	523	510
D-18	CN	H	H	545	517
E-18	H	H	NO ₂	560	528
F-18	CN	H	NO ₂	610	532

Dye est. No.	Mixing point °C	Dyeing time	Light fast- ness	Washing fastness									Dyeing results on polyester fabric ^o			
				Test-1			Test-2			Test-3				Fastness to dry heat		
				Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester		Change in colour	Staining cotton	Staining Poly- ester

B-3	158-60°	2	5-6	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	3
C-3	150-55°	2	3	5	5	5	5	5	5	5	5	5	4	4/5	4/5	2/3
D-3	152-155°	2	4-5	5	5	5	5	5	5	5	5	5	4	4/5	4/5	2/3
A-4	Liquid at room temp	2	4	5	5	5	5	5	5	5	5	5	2-3	4/5	4/5	1

room temp

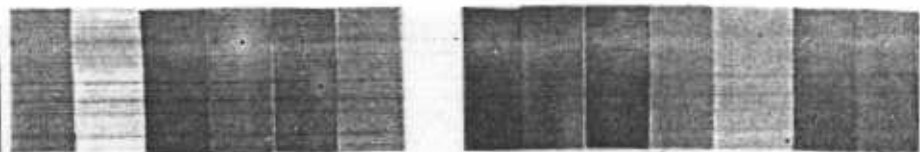
B-4	156-38°	2	5	5	5	5	5	5	5	5	5	5	4	4/5	4/5	2/3
C-4	106-107°	2	3	5	5	5	5	5	5	5	5	5	3-4	4	4	1/2
D-4	108-10°	2	4-5	5	5	5	5	5	5	5	5	5	4	4/5	4/5	2/3
A-5	Liquid at room temp	2	3-4	5	5	5	4-5	5	5	5	5	5	3	4/5	4/5	3/4

room temp

B-5	90-6°	2	4	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	4
C-5	88-90°	2	3	5	5	5	4/5	5	5	5	5	5	4	4/5	4/5	4
D-5	78°	2	3	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	4/5



Dye ref. No.	Mixture point °C	Dyeing time	Light fast- ness	Washing fastness												Dyeing results on polyester fabric		
				Test-1			Test-2			Test-3			Fastness to dry heat					
				Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester			
A-6	Liquid at room temp.	2	3-4	5	5	5	5	5	5	5	5	4-5	5	5	2-3	4/5	2	
B-6	101-102°	2	5	5	5	5	5	5	5	5	5	4-5	5	5	4	4	2	
C-6	98-100°	2	3-4	5	5	5	5	5	5	5	5	4-5	5	4/5	3-4	4/5	1	
D-6	90-92°	2	3-4	5	5	5	5	5	5	5	5	4-5	5	5	3-4	4/5	1	
A-7	Liquid at room temp.	2	2-3	5	5	5	5	5	5	5	5	4-5	5	4/5	4	4/5	4/5	
B-7	132°	2	3	5	5	5	5	5	5	5	5	4-5	5	5	5	5	5	
C-7	122-25°	2	2	5	5	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	
D-7	138-40°	2	2	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5	
A-8	Liquid at room temp.	2	3-4	5	5	5	5	5	5	5	4-5	5	5	5	3	4/5	4	
B-8	95-96°	2	4-5	5	5	5	5	5	5	5	5	5	5	5	4-5	4	3	
C-8	88°	2	3	5	5	5	5	5	5	5	5	4-5	5	5	4	4/5	4	



Dye ref. No.	Melting point ^o	Dyeing stage	Light fast- ness	Washing fastness												Dyeing results on polyester fabric ^o	
				Test-1			Test-2			Test-3			Fastness to dry heat				
				Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester		
D-8	110-111°	2	4	5	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	4/5
A-9	Liquid at room temp	2	2	5	5	5	5	5	5	5	5	4-5	5	4	5	5	4/5
B-9	152-53°	2	5	5	5	5	5	5	5	5	5	5	5	4-5	4/5	4	4
C-9	103-105°	2	4-5	5	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	4/5
D-9	120-22°	2	3-4	5	5	5	5	5	5	5	5	5	5	4-5	4/5	4/5	4/5
E-1	166-167°	2	3-4	5	5	5	5	5	5	5	5	5	5	4	4	4	2
F-1	154-155°	2	4	5	5	5	5	5	5	5	5	5	5	5	4/5	4	4
E-2	153-154°	2	5-6	5	5	5	5	5	5	5	5	5	5	4-5	4/5	4	4
F-2	137-40°	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
E-3	175-76°	2	5-6	5	5	5	4-5	5	5	5	5	4-5	5	4-5	4/5	3	3
F-3	140-43°	2	6	5	5	5	5	5	5	5	5	5	5	5	4/5	4	4
E-4	131-32°	2	5-6	5	5	5	5	5	5	5	5	5	5	4	3/4	2	2
F-4	177-70°	2	5-6	5	5	5	5	5	5	5	5	5	5	4-5	4	2/3	2/3



Dye No.	Melting point°C	Dyeing age	Light fast- ness	Washing fastness										Dyeing results on polyester fabric ^o				
				Test-1			Test-2			Test-3			Fastness to dry heat					
				Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour		Staining cotton	Staining Poly- ester		
F-5	142-43 ^o	2	5	5	5	5	5	5	5	5	5	4-5	5	5	5	4	4/5	2
F-5	176-85 ^o	2	5-6	5	5	5	5	5	5	5	5	5	5	5	5	4	4/5	3/4
F-6	134-35 ^o	2	5-6	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5	4
F-6	187-90 ^o	2	4-5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5
E-7	144-45 ^o	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5	4/5
F-7	148-50 ^o	2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5
F-8	148-55 ^o	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5	4
F-8	129-31 ^o	2	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5
F-9	183-85 ^o	2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5	3/4
F-9	144-53 ^o	2	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5
G-1	155-60 ^o (decomp.)	2	5	5	5	5	5	5	5	5	5	5	5	5	5	4-5	4/5	3/4
G-A1	175-76 ^o	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5
G-2	95-100 ^o (decomp.)	2	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4/5	4/5

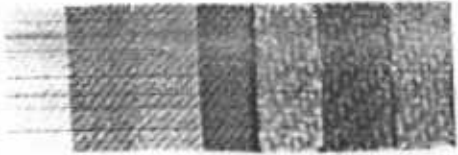
(cont.)

Dye ref. No.	Melting point °C	Dyeing age	Light fast- ness	Washing fastness												Dyeing results on polyester fabric ^o	
				Test-1			Test-2			Test-3			Fastness to dry heat				
				Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester	Change in colour	Staining cotton	Staining Poly- ester		
G-2A	176-80* (decomp.)	2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	
G-3	160* (decomp.)	2	5-6	5	5	5	5	5	5	5	5	5	5	5	5	4	
G-3A	222-25* (decomp.)	2	5	5	5	5	5	5	5	5	5	5	5	5	5	4/5	
G-4	133-35* (decomp.)	2	5-6	5	5	5	5	5	5	5	5	5	5	4	4/5	2/3	
G-4A	174-80* (decomp.)	2	6	5	5	5	5	5	5	5	5	5	5	5	4/5	3/4	

^o = The colour shades are approximate due to photographic processing.

Table 30 shows the physical data of acid and mordant acid dyes (from salicylic acid) and includes fastness (rating) to light, washing and bleaching and also patterns for dyeings on woolen fabric.

Table. 30
Physical Properties of acid and mordant acid dyes

Dye ref. No.	Dyeing % age	Light fast- ness	Washing fastness												Dyeing on Woolen fabric			
			Test-1			Test-2			Test-3			Bleaching fastness						
			Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool				
A-12	2	7	3	4/5	4/5	4/5	1-2	4/5	3/4	3/4	1-2	4/5	4/5	3/4	1	4/5	4/5	
A-12'	2	7	4-5	4/5	5	4	4	4	4/5	4/5	4	4/5	4/5	3/4	4	4/5	4/5	
B-12	2	7	2	3/4	4/5	4/5	1-2	3/4	3	3	1-2	4	4	3	1	4/5	4/5	
B-12'	2	7	4	4	5	4	4	3/4	4	4	4	4	4	4	3-4	3/4	4/5	
C-12	2	5-6	2-3	4/5	4/5	4/5	1-2	5	4	4	1	5	4/5	4/5	1	5	4/5	
C-12'	2	6-7	5	4/5	4/5	4/5	4-5	5	5	4/5	4	4	5	4/5	5	5	4/5	
D-12	2	6-7	2-3	5	5	5	1-2	5	4	4	1	4/5	4/5	3/4	1	4	4/5	

(cont.)

Dye No.	Dyeing age	Light fast- ness	Washing fastness												Dyeing results on woolen fabric ^o	
			Test-1			Test-2			Test-3			Bleaching fastness				
			Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool		
D-12	2	7	5	5	5	4-5	5	4/5	4	5	4/5	5	4	4	4/5	
S-13	2	3	2	3	4/5	1-2	3	3/4	1-2	3	4	1	4/5	3/4	3/4	
B-13	2	3	2-3	3/4	5	2	4	4/5	2	3	4/5	2-3	4/5	4/5	4/5	
C-13	2	3	3-4	4/5	5	2-3	4	4/5	1-2	4	4	3	4/5	5	5	
D-13	2	3	4	4/5	5	2-3	4	4/5	1-2	3/4	4/5	3-4	4/5	4/5	4/5	
A-14	2	6	4	4/5	5	2	4	4	1	4	3/4	3	4/5	4/5	4/5	
B-14	2	3	3	4/5	5	1-2	4	5	1	4/5	4/5	1-2	4/5	5	5	
C-14	2	3-4	4	4/5	5	2-3	4	4/5	1	4	3/4	3	4	5	5	
D-14	2	5	4	4/5	5	3	3	4	2	3	3/4	4	4	5	5	
A-15	2	3	4	3	4/5	3	2/3	2/3	3	2	2	4	2	3/4	3/4	
B-15	2	4	4	3	4/5	3	2/3	3	3-2	2	2	4	2	3/4	3/4	
C-15	2	3	4-5	3	4/5	4	3	3/4	3	2	2	4-5	2	3	3	
D-15	2	4	4	4	5	3	3	4	2	4	4	3	3	4/5	4/5	
A-16	2	3	3	3	4/5	2-3	3	3/4	3	2	2	2-3	3	3	4	



Dye cat. No.	Dyeing age	Light fast- ness	Washing fastness												Dyeing results on woolen fabric ^o		
			Test-1			Test-2			Test-3			Bleaching fastness					
			Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool			
B-16	2	4	3	3/4	4/5	2-3	3/4	4	2-3	2/3	3/4	3	2/3	3	2/3	4	
C-16	2	4	4	3/4	4/5	3	3	3/4	3	2/3	3	3-4	2/3	3	2/3	4	
D-16	2	3	4	3/4	4/5	4	3	3/4	3	3	3	4-5	3	3	3/4	3/4	
A-17	2	4	3	3/4	4/5	3	4	4	3	3	2/3	3	3/4	3	3/4	4	
B-17	2	4	3	3/4	4/5	2-3	3	3	2-3	3/4	2/3	2	3	3	3/4	3/4	
C-17	2	4	4-5	4	4/5	3	3	3	3	2/3	2	2-3	3	3	3	3	
D-17	2	4	4	3/4	4/5	3	2-3	2/3	3	2/3	2	3	3	3	3	3	
A-18	2	3	4	4	5	3	3	4/5	2	4/5	4/5	2-3	4/5	2-3	4/5	5	
B-18	2	3	4	4/5	5	3	3	4/5	2	4	4/5	3	3/4	3	3/4	4/5	
C-18	2	3	3-4	4/5	5	3	3	4/5	2	4	4/5	3	4/5	3	4/5	5	
D-18	2	3	4	4/5	5	2-3	3/4	4/5	2	3/4	4/5	3	4/5	3	4/5	5	
E-12	2	6	3	4/5	3/4	2	4/5	3/4	1	4	3/4	2	4	2	4	3/4	
E-12 [*]	2	4	5	5	5	5	5	5	2	4/5	4	3-4	4/5	3-4	4/5	4/5	
F-12	2	4	5	4/5	4	2	4/5	3/4	1	4/5	4	1	4/5	1	4/5	5	

(cont)

Washing fastness

Dye test No.	Dyeing stage	Light fastness	Washing fastness												Dyeing results on woolen fabric °	
			Test-1			Test-2			Test-3			Bleaching fastness				
			Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool	Change in colour	Staining cotton	Staining wool		
F-12	2	4	5	5	5	5	5	5	2	4/5	4	3-4	4/5	4/5	4/5	
F-13	2	3	2	4/5	4	3	4	1	1	3/4	4	1-2	3	4/5	4/5	
F-13	2	4	5	5	4/5	4	4/5	2-3	2-3	3/4	4/5	3	4/5	5	5	
E-14	2	3-4	4-5	5	5	4/5	5	1-2	1	4/5	4/5	2	4/5	5	5	
F-14	10	3	5	5	5	3-4	5	3-4	1-2	5	4/5	4	4/5	5	5	
E-15	2	3	4	2	4/5	3	3/4	3	2	3	3/4	4	2	3/4	3/4	
F-15	4	4	4-5	3	5	3	3/4	4/5	1-2	3	3/4	3	3	4/5	4/5	
E-16	2	3-4	3	4	5	2	3	4/5	1-2	2/3	4/5	3	2/3	4	4	
F-16	4	3	3	4/5	5	1-2	4/5	5	1	4/5	4/5	2-3	3	5	5	
E-17	2	4-5	3-4	3/4	4	2	3/4	3	1-2	3	2/3	3	2/3	2/3	2/3	
F-17	2	3	3	3/4	5	2	4	4/5	1	3/4	4	2-3	3	4/5	4/5	
E-18	2	3	3	3/4	4/5	2	2/3	4	1-2	4	4/5	3	2/3	4/5	4/5	
F-18	2	2	3	4	5	1-2	4	4/5	1	4/5	4	2-3	4	5	5	

* = Afterchroming

Table 31 shows the physical properties of dyes from naphthol and phenol derivatives and includes melting point, hue, solubility in various common solvents and change of hue in acidic and alkaline aqueous solution and also the solubility in water.

Table. 31
Physical properties of dyes from Naphthol and Phenol derivatives

Dye Ref. No.	Melting point, °C	Hue	Solubility in														
			Acetone	Benzene	Carbon tetra-chloride	Ethanol	Ethyl acetate	Stearic acid	Ethyl glycol	Toluene	Turpen-tine	Xylene	Paraffin wax	5% HCl soln.	5% Na ₂ CO ₃ soln.	Water	
A-10	133-4 ^m	Bright Orange (EtOH)	VS	VS	VS	S	VS	VS	VS	VS	S	VS	VS	VS	VS	VS	Insol
B-10	242-3 ^m	Orange (EtOH)	VS	VS	S	S	VS	VS	S	S	VS	VS	VS	S	VS	VS	Insol
C-10	178-9 ^m	Orange yellow (EtOH)	VS	VS	S	S	VS	VS	S	S	VS	VS	VS	SS	VS	VS	Insol
D-10	184-5 ^m	Orange yellow (EtOH)	VS	VS	VS	VS	VS	VS	S	S	VS	VS	VS	S	VS	VS	Insol
A-11	191-2 ^m	Reddish orange (EtOH)	VS	S	S	S	VS	VS	VS	VS	SS	SS	S	VS	VS	VS	Insol
B-11	233-4 ^m	Orange brown (EtOH)	VS	S	SS	S	VS	VS	S	S	VS	VS	VS	SS	SS	SS	Insol
C-11	219-20 ^m	Orange yellow (EtOH)	VS	S	SS	S	S	S	S	S	Insol	S	Insol	S	SS	SS	Insol

Dye Ref. No.	Melting point °C	Hue	Solubility in													
			Acetone	Benzene	Carbon tetra-chloride	Ethanol	Ethyl acetate	Succinic acid	Ethyl glycol	Toluene	Turpen-tine	Xylene	Paraffin wax	5% HCl soln.	5% Na ₂ CO ₃ soln.	Water
D-11	150-1 ^o	Reddish Orange (EtOH)	VS	VS	S	VS	VS	S	Insol	S	VSS	VS	SS	unalt	SB	Insol
A-19	164-2 ^o	Greenish yellow (EtOH)	VS	S	SS	VS	VS	S	S	S	S	S	S	B	S	SS
B-19	204-5 ^o	Yellow (EtOH)	VS	S	VSS	VS	VS	SS	SS	S	SS	S	SS	unalt	S	SS
C-19	178-80 ^o	Bright yellow (EtOH)	VS	S	VSS	VS	VS	S	VSS	SS	VSS	SS	VSS	VSS	VS	S
D-19	214 ^o	Yellow (EtOH)	VS	S	VSS	VS	VS	S	SS	SS	SS	S	VSS	unalt	S	SS
A-20	164-6 ^o	Greenish yellow (EtOH)	VS	VS	VS	S	VS	S	VSS	VS	VS	VS	VS	SB	SB	Insol
B-20	168 ^o	Yellow (EtOH)	VS	VS	S	VS	S	S	VSS	VS	S	VS	VS	unalt	SB	SS
C-20	157-9 ^o	Greenish yellow (EtOH)	VS	VS	VS	VS	VS	VS	Insol	VS	S	VS	VS	unalt	S	SS
D-20	134-6 ^o	Greenish yellow (EtOH)	VS	VS	VS	VS	VS	VS	Insol	VS	S	VS	S	unalt	unalt	Insol
E-10	260-3 ^o	Orange yellow (acetone)	S	S	SS	SS	S	S	Insol	S	Insol	S	SS	unalt	unalt	Insol
F-10	280-3 ^o	Orange yellow (acetone)	S	SS	Insol	VSS	S	SS	Insol	SS	SS	SS	SS	unalt	unalt	Insol

Dye Ref. No.	Melting point °C	Hue	Solubility in													
			Acetone	Benzene	Carbon tetrachloride	Ethanol	Ethyl acetate	Succinic acid	Ethyl glycol	Toluene	Turpentine	Xylene	Paraffin wax	5% HCl soln.	5% Na ₂ CO ₃ soln.	Water
E-11	> 283.5°	Orange brown (acetone)	VS	S	SS	S	VS	S	VSS	S	SS	S	S	unalt	SB	Insol
F-11	200°	Green (acetone)	VS	SS	Insol	S	S	S	SS	SS	Insol	VSS	Insol	unalt	unalt	Insol
E-19	194.6°	Yellowish orange (EtOH)	VS	S	Insol	VS	VS	VS	VSS	S	S	SS	SS	SB	unalt	Insol
F-19	202.10° (13.5 comp., orange (EtOH))	Bluish orange (EtOH)	VS	S	Insol	S	VS	VS	SS	S	SS	S	Insol	unalt	S	SS
E-20	191.3°	Greenish yellow (acetone)	VS	VS	S	SS	VS	VS	Insol	VS	S	VS	VS	unalt	unalt	Insol
F-20	130.5°	Reddish yellow (EtOH)	S	S	VSS	S	S	S	VSS	S	Insol	SS	Insol	unalt	SB	Insol

VS = Very soluble
 SS = Slightly soluble
 Insol = Insoluble
 SB = Slightly bleeds

S = Soluble
 VSS = Very slightly soluble
 Unalt = Unaltered
 B = Bleeds

Table 32 gives the colorimetric data of all the dyes which have been applied on fibres, disperse on polyester and acid on woolen. All the data was recorded on computerised colorimeter.

Table 32

Tristimulus values, chromaticity and CIELAB coordinates of disperse and acid dyes for the CIE 1931 standard observer (2°) under illuminant D₆₅ for 2/3 dyeing

Dye Ref. No.	Colour difference ΔE	Tristimulus values				Chromaticity coordinates			CIELAB coordinates		
		X	Y	Z	x	y	L*	a*	b*		
A-1		45.91	40.76	4.51	0.50353	0.44706	70.04	21.69	79.11		
B-1	A-1, B-1 = 53.08	34.43	23.73	3.02	0.56287	0.38778	55.83	47.02	63.26		
C-1	A-1, C-1 = 15.36	47.40	37.44	3.05	0.53930	0.42597	67.64	26.25	83.39		
D-1	A-1, D-1 = 22.43	40.32	29.98	3.06	0.54963	0.40869	60.66	41.15	73.06		
A-2		51.99	48.50	7.02	0.48360	0.45110	75.17	16.19	76.92		
B-2	A-2, B-2 = 41.26	41.26	28.52	5.06	0.55129	0.38105	60.38	49.58	59.71		
C-2	A-2, C-2 = 14.49	47.34	39.64	5.09	0.51422	0.43054	69.04	29.17	74.88		
D-2	A-2, D-2 = 38.93	43.45	32.07	8.54	0.51689	0.38154	63.43	43.03	51.28		
A-3		40.32	39.24	11.66	0.44205	0.43017	68.95	9.75	51.44		
B-3	A-3, B-3 = 39.46	39.23	28.82	2.89	0.55303	0.40619	60.65	42.13	72.41		
C-3	A-3, C-3 = 38.13	51.05	44.07	3.99	0.51509	0.44464	72.30	26.06	85.75		
D-3	A-3, D-3 = 43.49	45.68	34.28	2.85	0.55164	0.41392	65.21	41.84	80.56		
A-4		46.91	38.06	3.37	0.53104	0.43085	68.09	32.90	32.16		

(cont.)

Dye Ref. No.	Colour difference ΔE	Tristimulus values			Chromaticity coordinates			CIELAB coordinates		
		X	Y	Z	x	y	L*	a*	b*	
B-4	A-4, B-4 = 37.62	29.95	17.98	2.92	0.58891	0.35362	49.50	58.11	53.00	
C-4	A-4, C-4 = 45.32	43.19	31.18	2.97	0.55839	0.40315	62.69	45.45	75.38	
D-4	A-4, D-4 = 39.31	41.46	29.39	3.69	0.55622	0.39431	61.15	46.87	68.25	
A-5		50.15	49.63	8.65	0.46250	0.45776	75.88	8.26	72.38	
B-5	A-5, B-5 = 32.87	45.67	35.00	3.76	0.54093	0.41460	65.78	39.35	75.84	
C-5	A-5, C-5 = 14.03	56.49	52.72	6.47	0.48836	0.45573	77.74	16.59	83.52	
D-5	A-5, D-5 = 16.65	51.58	45.12	7.93	0.49299	0.43118	73.00	24.47	69.85	
A-7		59.51	53.86	17.67	0.45412	0.41106	78.42	21.04	53.63	
B-7	A-7, B-7 = 53.01	28.79	16.92	6.37	0.55283	0.32494	48.18	59.33	32.99	
C-7	A-7, C-7 = 29.09	43.80	31.65	8.61	0.52104	0.37653	63.08	45.56	50.45	
D-7	A-7, D-7 = 56.41	28.11	16.45	7.98	0.53504	0.31308	47.58	59.27	25.88	
A-8		58.07	60.01	13.94	0.43986	0.45452	81.68	2.66	67.87	
B-8	A-8, B-8 = 36.31	46.80	37.49	3.84	0.53100	0.42540	67.67	34.40	78.60	
C-8	A-8, C-8 = 22.22	55.74	52.87	6.28	0.48515	0.46019	77.83	14.32	86.40	
D-8	A-8, D-8 = 33.10	51.02	42.89	3.97	0.52128	0.43820	71.51	29.40	84.52	
A-9		39.43	38.11	18.25	0.41073	0.39915	68.28	9.84	34.98	
B-9	A-9, B-9 = 53.58	45.61	34.89	3.14	0.54531	0.41721	65.69	39.55	79.50	
C-9	A-9, C-9 = 55.33	54.86	48.70	4.49	0.50774	0.45073	75.29	23.04	88.26	
D-9	A-9, D-9 = 45.85	50.95	45.18	5.67	0.50044	0.44385	73.04	22.59	78.77	
A-12		47.99	48.31	9.01	0.45570	0.45877	75.05	5.92	69.78	
B-12	A-12, B-12 = 16.35	38.66	34.70	5.05	0.49297	0.44259	65.55	19.18	68.67	
C-12	A-12, C-12 = 5.80	43.08	42.03	7.42	0.46555	0.45424	70.92	9.64	68.11	
D-12	A-12, D-12 = 12.98	44.06	43.06	11.03	0.44887	0.43387	71.63	9.49	57.78	
A-13		10.91	5.78	5.78	0.48574	0.25703	28.85	49.83	2.13	
B-13	A-13, B-13 = 26.93	6.11	4.40	5.55	0.38028	0.27406	24.97	23.79	-3.56	
C-13	A-13, C-13 = 21.87	5.63	3.65	4.08	0.42139	0.27332	22.49	29.07	-0.57	
D-13	A-13, D-13 = 18.62	6.74	4.14	5.89	0.40178	0.24705	24.15	33.98	-6.44	
A-14		36.47	23.03	2.92	0.58425	0.36896	55.13	56.95	62.71	

Dye Ref. No.	Colour difference ΔE	Tristimulus values			Chromaticity coordinates			CIELAB coordinates		
		X	Y	Z	x	y	L*	a*	b*	
B-14	A-14, B-14 = 29.66	39.67	30.02	11.26	0.49010	0.37079	61.69	39.00	40.02	
C-14	A-14, C-14 = 33.40	31.09	24.84	7.82	0.48775	0.38965	56.94	30.31	42.59	
D-14	A-14, D-14 = 38.96	18.31	13.25	4.35	0.51003	0.36890	43.15	33.99	33.59	
A-15		15.18	8.67	1.88	0.59010	0.33692	35.35	50.08	36.84	
B-15	A-15, B-15 = 24.54	6.89	4.09	1.57	0.54878	0.32576	23.79	36.26	20.17	
C-15	A-15, C-15 = 27.50	6.38	3.98	1.61	0.53300	0.33249	23.62	32.55	19.19	
D-15	A-15, D-15 = 23.12	10.02	6.94	2.60	0.51235	0.35471	31.68	30.82	24.58	
A-16		27.44	19.41	2.12	0.56033	0.39636	51.19	41.05	61.98	
B-16	A-16, B-16 = 52.78	25.75	21.72	17.05	0.39917	0.33661	53.75	23.09	12.41	
C-16	A-16, C-16 = 29.96	12.83	8.81	1.88	0.54554	0.37472	35.64	34.05	37.34	
D-16	A-16, D-16 = 56.27	6.02	3.81	2.03	0.50768	0.32125	23.05	31.13	14.27	
A-17		7.37	4.76	2.73	0.49598	0.32007	26.05	32.12	13.19	
B-17	A-17, B-17 = 19.06	15.47	9.26	7.86	0.47480	0.38409	36.49	46.90	7.20	
C-17	A-17, C-17 = 7.82	7.84	4.76	2.00	0.53676	0.32621	26.06	36.44	19.71	
D-17	A-17, D-17 = 4.56	7.18	4.38	3.00	0.49337	0.30059	24.89	35.25	10.07	
A-18		8.65	5.50	5.62	0.43758	0.27829	28.13	34.81	1.00	
B-18	A-18, B-18 = 12.71	6.97	4.19	6.96	0.38448	0.23139	24.31	35.60	-10.50	
C-18	A-18, C-18 = 5.67	8.38	4.92	4.43	0.47268	0.27735	26.51	39.42	4.47	
D-18	A-18, D-18 = 10.47	6.54	3.67	5.23	0.42383	0.23746	22.55	38.88	-6.27	
E-1		18.62	10.52	3.02	0.57893	0.32704	38.77	54.45	33.83	
F-1	E-1, F-1 = 48.73	6.82	4.41	6.30	0.38892	0.25175	25.00	31.11	-6.68	
E-2		20.84	11.60	3.49	0.57999	0.32279	40.59	57.75	33.98	
F-2	E-2, F-2 = 59.03	6.96	4.41	9.16	0.33900	0.21469	24.68	32.62	-17.01	
E-3		27.77	16.57	2.70	0.59035	0.35225	47.73	57.24	51.52	
F-3	E-3, F-3 = 47.47	8.88	5.37	3.34	0.50487	0.30520	27.77	38.32	12.83	
E-4		12.37	6.90	3.06	0.55395	0.30909	31.60	48.35	21.23	
F-4	E-4, F-4 = 43.46	3.57	2.64	4.13	0.34526	0.25515	18.53	18.64	-07.67	
E-5		28.94	17.39	2.74	0.58975	0.35438	48.77	57.39	53.01	

Dye Ref. No.	Colour difference ΔE	Tristimulus values			Chromaticity coordinates			CIE LAB coordinates		
		X	Y	Z	x	y	L*	a*	b*	
F-5	E-5, F-5 = 60.11	10.95	6.33	7.29	0.44554	0.25784	30.26	44.01	-01.48	
E-6		18.62	10.52	3.02	0.57893	0.33704	38.77	54.45	33.83	
F-6	E-6, F-6 = 44.02	11.53	6.89	9.90	0.40718	0.24322	31.56	42.63	-07.96	
E-7		8.96	5.27	5.63	0.45130	0.26534	27.50	40.19	0.47	
F-7	E-7, F-7 = 40.47	4.82	4.26	12.28	0.22548	0.19955	24.54	10.42	-26.78	
E-8		31.37	19.46	2.92	0.58367	0.36208	51.25	55.89	56.06	
F-8	E-8, F-8 = 43.37	14.24	8.13	4.65	0.52696	0.30103	34.28	48.99	16.75	
E-9		30.45	20.08	3.12	0.56753	0.37430	51.95	49.42	55.90	
F-9	E-9, F-9 = 37.84	18.02	10.59	5.57	0.52713	0.30999	38.91	50.70	20.40	
E-12		40.82	34.79	4.45	0.50990	0.43455	65.61	25.69	71.78	
F-12	E-12, F-12 = 20.70	29.10	22.75	4.07	0.52042	0.40682	54.83	31.86	55.22	
E-13		6.75	5.35	9.03	0.31952	0.25317	27.72	18.73	-11.87	
F-13	E-13, F-13 = 12.53	5.39	5.13	9.29	0.27203	0.25898	27.12	6.35	-13.75	
E-14		23.78	16.30	4.30	0.53576	0.36739	47.39	41.98	-41.15	
F-14	E-14, F-14 = 32.07	19.09	17.74	7.58	0.42983	0.39951	49.20	11.92	30.10	
E-15		4.16	3.05	1.99	0.45211	0.33126	20.24	20.07	9.76	
F-15	E-15, F-15 = 3.85	4.66	3.66	2.79	0.41934	0.32959	22.52	17.00	7.45	
E-16		10.02	6.15	2.97	0.52355	0.32120	29.80	38.94	18.72	
F-16	E-16, F-16 = 20.28	14.07	11.13	8.95	0.41205	0.32587	39.82	24.08	9.23	
E-17		4.04	2.74	3.70	0.38547	0.26150	18.97	23.79	-4.49	
F-17	E-17, F-17 = 11.44	6.99	5.65	7.73	0.34307	0.27726	28.52	17.69	-6.10	
E-18		2.59	2.42	4.77	0.26488	0.24768	17.58	5.84	-12.63	
F-18	E-18, F-18 = 11.64	4.26	4.11	10.35	0.22747	0.21942	24.04	5.11	-22.29	
G-1		12.17	7.50	2.84	0.54067	0.33315	32.93	41.23	25.02	
G-1A	G-1, G-1A = 59.46	4.85	3.41	11.83	0.24155	0.16993	21.65	23.34	-30.55	
G-2		9.78	6.19	4.72	0.47268	0.29906	29.90	36.60	8.83	
G-2A	G-2, G-2A = 42.67	8.30	7.19	18.33	0.24542	0.21258	32.25	13.99	-27.29	
G-3		21.74	14.33	3.28	0.55257	0.36416	44.72	44.23	42.44	

Dye Ref. No.	Colour difference ΔE	Tristimulus values			Chromaticity coordinates			CIELAB coordinates		
		X	Y	Z	x	y		L*	a*	b*
G-3A	G-3, G-3A = 60.37	6.29	4.32	7.50	0.34728	0.23851		24.73	26.84	-11.81
G-4		6.67	4.38	2.74	0.48388	0.31741		24.89	30.11	11.87
G-4A	G-4, G-4A = 44.29	3.73	2.70	10.19	0.22459	0.16226		18.80	20.06	-30.84