

## Material Applications of Novel Disperse and Mordent Azo Dyes Based on 2-Hydroxy-4-methoxybenzophenone

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Novels disperse and mordent azo dyes were prepared by coupling of various diazo solutions of aromatic amines with 2-hydroxy-4-methoxybenzophenone. The resultant dyes were characterized by elemental analyses, IR and <sup>1</sup>H NMR spectral studies. The UV-visible spectral data have also been discussed in terms of structural property relationship. The dyeing performance of all the dyes was evaluated on wool and polyester textile fibers. The dyeing of chrome pretreated wool and polyesters have also been monitored. The results show that better hue was obtained on mordented fiber. Results of bactericidal studies of chrome pretreated fibers revealed that the toxicity of mordented dyes against bacteria is fairly good. Some of the dyes have also been used for pigmentation as well as photo stabilization of polymethyl methacrylate sheet.

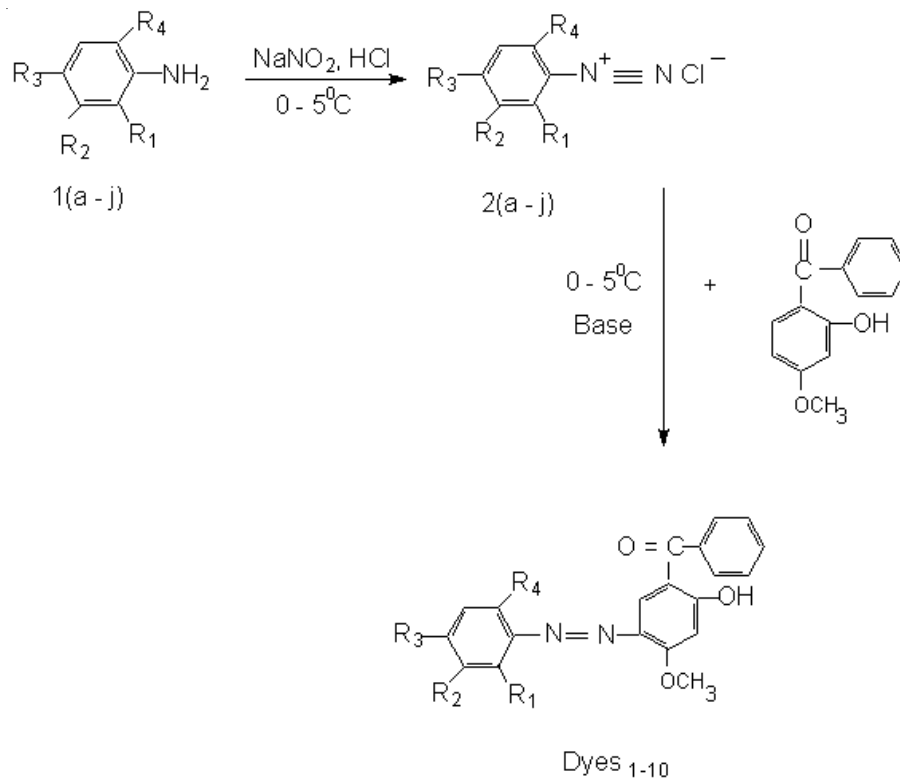
**Key Words:** Disperse dye, Mordent dye, UV absorber, Wool and Polyester textile fibers and Microbial activity.

### INTRODUCTION

In the field of azo dyes the phenolic derivatives play a major role in most of the commercial dyes<sup>1-6</sup>. They are marketed in the form of azo disperse, azo-vat, azo acid dyes, *etc.* All of these dyes are made up of one part of naphthols having hydroxyl group as auxochrome group. One of the hydroxy compounds *i.e.* 2-hydroxy-4-methoxybenzophenone having one hydroxy group (as auxochrome) and a keto group (chromophore) has shown wide applications as a polymer additive<sup>7-9</sup>. It is an excellent UV absorber, which prevents the photo degradability of most of thermoplasts<sup>10-12</sup>. The area in which the azo dyes formation based on this compound has not been developed so far except of few patents<sup>13-16</sup>. Thus, in continuation of our earlier work<sup>17</sup>, the present communication comprises the studies on azo dyes based on 2-hydroxy-4-methoxybenzophenone.

### EXPERIMENTAL

All the chemicals used were of analytical grade and were further purified by crystallization. The aniline derivatives listed in **Scheme-I** were used for diazotization. Melting points were determined by open capillary method and were uncorrected. The visible absorption spectra were measured on a Carl Zeiss UV/Vis Specord



Dyes No	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	Amines <b>1(a-j)</b>
D <sub>1</sub>	NO <sub>2</sub>	H	H	H	2-Nitroaniline
D <sub>2</sub>	H	H	NO <sub>2</sub>	H	4-Nitroaniline
D <sub>3</sub>	H	NO <sub>2</sub>	H	H	3-Nitroaniline
D <sub>4</sub>	Cl	H	NO <sub>2</sub>	Cl	2,6-Dichloro-4-nitroaniline
D <sub>5</sub>	CH <sub>3</sub>	H	CH <sub>3</sub>	H	2,4-Dimethylaniline
D <sub>6</sub>	H	Cl	H	H	3-Chloroaniline
D <sub>7</sub>	H	H	Cl	H	4-Chloroaniline
D <sub>8</sub>	H	H	OH	H	4-hydroxyaniline
D <sub>9</sub>	H	H	CH <sub>3</sub>	H	4-Methylaniline
D <sub>10</sub>	CH <sub>3</sub>	H	H	H	2-Methylaniline

**Scheme-I:** Synthesis of 2-hydroxy-4-methoxybenzophenone based dyes (D<sub>1-10</sub>)

spectrometer and elemental analysis was carried out on Perkin-Elmer CHNS/O Analyzer 2400 Series II. Infrared spectra were recorded in KBr pellets on a Perkin-Elmer Spectrum GX FTIR model, <sup>1</sup>H NMR spectra were recorded on Hitachi R- 1500 in DMSO-*d*<sub>6</sub> solvent and TLC (thin layer chromatography) was run on a aluminum sheets precoated with silica gel 60 F245, (Merck, Germany) using methanol:water:acetic acid (12:3:7) solvent system. Colour spot was visualized by UV chamber. HTHP dyeing machine (model-LL) was used for dyeing purpose.

### Preparation of disperse azo dyes

**Diazotization and coupling procedure:** Diazotization of various aromatic amines **1a-j** (Scheme-I) was carried out by the reported method<sup>18,19</sup>. The coupling of above diazotized aromatic amines with 2-hydroxy-4-methoxybenzophenone was carried out by the reported method<sup>18,19</sup> and the resulting dyes were designated as dye (**D<sub>1</sub>-D<sub>10</sub>**) and were recrystallized in acetic acid.

**Disperse and mordent dyeing method:** Disperse and mordent dyeing of above prepared dyes was carried out on polyester and wool fiber respectively by the reported method<sup>17</sup>.

**Use of selective dyes in polymethyl methacrylate (PMMA) sheet:** The prepared dyes (**D<sub>1</sub>, D<sub>5</sub>, D<sub>8</sub>, D<sub>10</sub>**), (0.005 %) were dissolved in methyl methacrylate monomer and were blended with (10 %) pre syrup of PMMA. The casting of above syrup was done between two glass toughened plates and the curing of above syrup was done in hot water bath. The whole experiment was carried out at polymer division of G.S.F. Company Ltd., Baroda. The produced sheets were light yellow to dark yellow in colour. The  $\lambda_{\max}$  values of normal transparent acrylic sheet containing UV-absorbent shift from 298 to 458 nm, upon addition of prepared dyes samples.

**Antibacterial studies:** Disperse dyes shows antibacterial activity<sup>20</sup> therefore antibacterial activity for selected dyes was performed. The results shown in Table-4 are inhibiting the bacteria *ca.* 70 %. The dye pattern of chrome treated dye may be affordable for human body.

**Characteristic data of dyes: 1-[2-hydroxy-4-methoxy-5-(2-nitrophenylazo)phenyl]-1-phenylmethanone (**D<sub>1</sub>**):** Calculated for C<sub>20</sub>H<sub>15</sub>N<sub>3</sub>O<sub>5</sub>: m.w. 377, yield: 74 %, m.p. 110-115 °C, R<sub>f</sub> value: 0.80; elemental analysis calcd. (%): C, 63.66; H, 3.98; N, 11.14. Found (%): C, 63.60; H, 3.91; N, 11.10. IR (KBr,  $\nu_{\max}$ , cm<sup>-1</sup>): 3462 (-OH); 3075 (=CH, aromatic); 1629 (C=O, diaryl); 1523 (N=N); 1483 (C=C, aromatic); 1335 (C-N); 1212-1024 (C-O-C, stretching); 1102 (C-O); 734, 585, 482 (for substituted benzene). <sup>1</sup>H NMR: 7.3-7.4  $\delta$  (Ar-H, multiplet), 5.5  $\delta$  (Ar-OH, singlet), 3.82  $\delta$  (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(4-nitrophenylazo)phenyl]-1-phenylmethanone (**D<sub>2</sub>**):** Calculated for C<sub>20</sub>H<sub>15</sub>N<sub>3</sub>O<sub>5</sub>: m.w. 377, yield: 80 %, m.p. 145-150 °C, R<sub>f</sub> value: 0.83; elemental analysis calcd. (%): C, 63.66; H, 3.98; N, 11.14. Found (%): C, 63.60; H, 3.91; N, 11.10. IR (KBr,  $\nu_{\max}$ , cm<sup>-1</sup>): 3451 (-OH); 3085 (=CH, aromatic); 1626 (C=O, diaryl); 1524 (N=N); 1492 (C=C, aromatic); 1347 (C-N); 1211-1021 (C-O-C, stretching); 1102 (C-O); 741, 566, 477 (for substituted benzene). <sup>1</sup>H NMR: 7.3-7.4  $\delta$  (Ar-H, multiplet), 6.1  $\delta$  (Ar-OH, singlet), 3.82  $\delta$  (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(3-nitrophenylazo)phenyl]-1-phenylmethanone (**D<sub>3</sub>**):** Calculated for C<sub>20</sub>H<sub>15</sub>N<sub>3</sub>O<sub>5</sub>: m.w. 377, yield: 80 %, m.p. 150-155 °C, R<sub>f</sub> value: 0.86; elemental analysis calcd. (%): C, 63.66; H, 3.98; N, 11.14. Found (%): C, 63.60; H, 3.91; N, 11.10. IR (KBr,  $\nu_{\max}$ , cm<sup>-1</sup>): 3481 (-OH); 3070 (=CH, aromatic); 1632 (C=O, diaryl); 1542 (N=N); 1483 (C=C, aromatic); 1337 (C-N); 1212-1020 (C-O-C, stretching); 1103 (C-O); 737, 562, 472 (for substituted benzene). <sup>1</sup>H NMR: 7.1-7.3  $\delta$  (Ar-H, multiplet), 5.5  $\delta$  (Ar-OH, singlet), 3.82  $\delta$  (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(2,5-dichloro-4-nitrophenylazo)phenyl]-1-phenylmethanone (D<sub>4</sub>):** Calculated for C<sub>20</sub>H<sub>13</sub>N<sub>3</sub>O<sub>5</sub>Cl<sub>2</sub>: m.w. 446, yield: 84 %, m.p. 250-255 °C, R<sub>f</sub> value: 0.90; elemental analysis calcd. (%): C, 53.81; H, 2.91; N, 9.41. Found (%): C, 53.70; H, 2.88; N, 9.25. IR (KBr, ν<sub>max</sub>, cm<sup>-1</sup>): 3634 (-OH); 3081 (=CH, aromatic); 1655 (C=O, diaryl); 1530 (N=N); 1475 (C=C, aromatic); 1341 (C-N); 1210-1021 (C-O-C, stretching); 1102 (C-O); 781, 743, 581, 487 (for substituted benzene). <sup>1</sup>H NMR: 7.0-7.2 δ (Ar-H, multiplet), 6.12 δ (Ar-OH, singlet), 3.84 δ (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(2,4-dimethylphenylazo)phenyl]-1-phenylmethanone (D<sub>5</sub>):** Calculated for C<sub>22</sub>H<sub>20</sub>N<sub>2</sub>O<sub>3</sub>: m.w. 360, yield: 81 %, m.p. 98-103 °C, R<sub>f</sub> value: 0.82; elemental analysis calcd. (%): C, 73.33; H, 5.55; N, 7.77. Found (%): C, 73.16; H, 5.46; N, 7.68. IR (KBr, ν<sub>max</sub>, cm<sup>-1</sup>): 3571 (-OH); 3073 (=CH, aromatic); 1622 (C=O, diaryl); 1533 (N=N); 1481 (C=C, aromatic); 1462 (C-N); 1210-1023 (C-O-C, stretching), 1341 (C-O); 1101, 734, 572, 470 (for substituted benzene). <sup>1</sup>H NMR: 7.2-7.4 δ (Ar-H, multiplet), 6.1 δ (Ar-OH, singlet), 1.98 δ (-CH<sub>3</sub>, singlet), 3.81 δ (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(3-chlorophenylazo)phenyl]-1-phenylmethanone (D<sub>6</sub>):** Calculated for C<sub>20</sub>H<sub>15</sub>N<sub>2</sub>O<sub>3</sub>Cl: m.w. 367, yield: 86 %, m.p. 120-125 °C, R<sub>f</sub> value: 0.91; elemental analysis calcd. (%): C, 65.39; H, 4.08; N, 7.62. Found (%): C, 65.27; H, 4.01; N, 7.53. IR (KBr, ν<sub>max</sub>, cm<sup>-1</sup>): 3431 (-OH); 3064 (=CH, aromatic); 1632 (C=O, diaryl); 1583 (N=N); 1480 (C=C, aromatic); 1351 (C-N); 1210-1022 (C-O-C, stretching); 1102 (C-O); 785, 743, 585, 485 (for substituted benzene). <sup>1</sup>H NMR: 7.0-7.4 δ (Ar-H, multiplet), 5.7 δ (Ar-OH, singlet), 3.81 δ (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(4-chlorophenylazo)phenyl]-1-phenylmethanone (D<sub>7</sub>):** Calculated for C<sub>20</sub>H<sub>15</sub>N<sub>2</sub>O<sub>3</sub>Cl: m.w. 367, yield: 86 %, m.p. 125-130 °C, R<sub>f</sub> value: 0.91; elemental analysis calcd. (%): C, 65.39; H, 4.08; N, 7.62. Found (%): C, 65.27; H, 4.01; N, 7.53. IR (KBr, ν<sub>max</sub>, cm<sup>-1</sup>): 3592 (-OH); 3062 (=CH, aromatic); 1630 (C=O, diaryl); 1531 (N=N); 1473 (C=C, aromatic); 1321 (C-N); 1211-1023 (C-O-C, stretching); 1102 (C-O); 783, 740, 584, 472 (for substituted benzene). <sup>1</sup>H NMR: 7.1-7.5 δ (Ar-H, multiplet), 5.9 δ (Ar-OH, singlet), 3.82 δ (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(4-hydroxyphenylazo)phenyl]-1-phenylmethanone (D<sub>8</sub>):** Calculated for C<sub>20</sub>H<sub>16</sub>N<sub>2</sub>O<sub>4</sub>: m.w. 348, yield: 78 %, m.p. 85-90 °C, R<sub>f</sub> value: 0.82; elemental analysis calcd. (%): C, 68.96; H, 4.59; N, 8.04. Found (%): C, 68.91; H, 4.49; N, 8.00. IR (KBr, ν<sub>max</sub>, cm<sup>-1</sup>): 3582 (-OH); 3055 (=CH, aromatic); 1634 (C=O, diaryl); 1520 (N=N); 1476 (C=C, aromatic); 1325 (C-N); 1212-1023 (C-O-C, stretching); 1103 (C-O); 745, 579, 475 (for substituted benzene). <sup>1</sup>H NMR: 7.2-7.4 δ (Ar-H, multiplet), 5.7 δ (Ar-OH, singlet), 3.82 δ (-OCH<sub>3</sub>, singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(4-methylphenylazo)phenyl]-1-phenylmethanone (D<sub>9</sub>):** Calculated for C<sub>21</sub>H<sub>18</sub>N<sub>2</sub>O<sub>3</sub>: m.w. 346, yield: 85 %, m.p. 105-110 °C, R<sub>f</sub> value: 0.89; elemental analysis calcd. (%): C, 72.83; H, 5.20; N, 8.09. Found (%):

C, 72.78; H, 5.11; N, 8.03. IR (KBr,  $\nu_{\max}$ ,  $\text{cm}^{-1}$ ): 3631 (-OH); 3023 (=CH, aromatic); 1628 (C=O, diaryl); 1526 (N=N); 1467 (C=C, aromatic); 1447 ( $\text{CH}_3$ ); 1352 (C-N); 1212-1022 (C-O-C, stretching); 1112 (C-O); 748, 586, 475 (for substituted benzene).  $^1\text{H}$  NMR: 7.3  $\delta$  (Ar-H, multiplet), 5.7  $\delta$  (Ar-OH, singlet), 1.97  $\delta$  ( $-\text{CH}_3$ , singlet), 3.84  $\delta$  ( $-\text{OCH}_3$ , singlet, 3H).

**1-[2-Hydroxy-4-methoxy-5-(2-methylphenylazo)phenyl]-1-phenyl-methanone ( $\text{D}_{10}$ ):** Calculated for  $\text{C}_{21}\text{H}_{18}\text{N}_2\text{O}_3$ : m.w. 346, yield: 85 %, m.p. 170-175  $^\circ\text{C}$ ,  $R_f$  value: 0.89; elemental analysis calcd. (%): C, 72.83; H, 5.20; N, 8.09. Found (%): C, 72.78; H, 5.11; N, 8.03. IR (KBr,  $\nu_{\max}$ ,  $\text{cm}^{-1}$ ): 3505 (-OH); 3055 (=CH, aromatic); 1633 (C=O, diaryl); 1537 (N=N); 1474 (C=C, aromatic); 1456 ( $\text{CH}_3$ ); 1323 (C-N); 1211-1022 (C-O-C, stretching); 1110 (C-O); 749, 577, 469 (for substituted benzene).  $^1\text{H}$  NMR: 7.1-7.3  $\delta$  (Ar-H, multiplet), 5.6  $\delta$  (Ar-OH, singlet), 1.97  $\delta$  ( $-\text{CH}_3$ , singlet), 3.83  $\delta$  ( $-\text{OCH}_3$ , singlet, 3H).

**Fastness property:** The fastness to light, sublimation and perspiration of dye pattern was assessed according to British standard: 1006-1978 and the wash fastness test according to Indian standard: IS: 765-1979. The rubbing fastness was tested by using Crock meter (Atlas) AATCC-1961, as shown in Tables 2 and 3.

**Determination of the percentage exhaustion and fixation:** The dye bath percentage exhaustion and fixation of the dyed fabric was determined according to the reported method<sup>21</sup> (Table-1).

## RESULTS AND DISCUSSION

**Physical properties of dyes:** All the dyes were obtained in the form of amorphous powder, ranging from yellow to reddish brown in colour. The TLC results show that only a single spot is observed for each dye. The melting points of purified dyes measured by open capillary tube and were found uncorrected. The results of elemental analysis content of each dye are consistent with the predicted structure as shown in **Scheme-I**.

The number of azo group is almost one for each dye. The nitrogen content and number of azo groups for each dye are co-related with each other. The IR spectrum of each dye comprises the important features (shown above) of aromatic, azo, hydroxyl and keto groups. The  $^1\text{H}$  NMR spectra of all the diazo compounds based on 2-hydroxy-4-methoxybenzophenone shows important signal at their respective positions confirming the structures of various dyes as shown in **Scheme-I**. The visible absorption spectroscopic properties of dyes were recorded in DMF solution. The absorption maxima ( $\lambda_{\max}$ ) of all the dyes fall into the range of 412-450 nm in DMF, as shown in Table-1. The value of the logarithm of molar extinction coefficient ( $\log \epsilon$ ) of all the dyes was in the range of 4.10-4.41, consistent with their high intensity of absorption. Moreover, the presence of electron donating or electron attracting groups did not bring about any marked increase or decreased in  $\lambda_{\max}$  in the visible region and  $\log \epsilon$  remained nearly constant. However, electron attracting substituents like -Cl and  $-\text{NO}_2$  in the substituent group of the coupler increase polarizability and results in bathochromic shifts.

TABLE-1  
 ABSORPTION MAXIMA ( $\lambda_{\max}$ ), INTENSITIES ( $\log \epsilon$ ), EXHAUSTION (E) AND  
 FIXATION (F) OF DISPERSE/MORDENT DYES ON POLYESTER / WOOL

Dyes No.	Absorption maxima ( $\lambda_{\max}$ ) nm in DMF	Intensities $\log \epsilon$	Mordent dyeing on wool (%)		Disperse dyeing on polyester (%)	
			Exhaustion	Fixation	Exhaustion	Fixation
D <sub>1</sub>	428	4.30	78	92	70	91
D <sub>2</sub>	424	4.20	72	95	73	83
D <sub>3</sub>	429	4.26	76	92	82	90
D <sub>4</sub>	450	4.20	84	94	72	83
D <sub>5</sub>	428	4.22	76	90	73	85
D <sub>6</sub>	432	4.41	72	92	70	93
D <sub>7</sub>	438	4.29	84	93	72	95
D <sub>8</sub>	412	4.10	82	90	70	82
D <sub>9</sub>	428	4.24	73	93	73	91
D <sub>10</sub>	423	4.17	75	91	75	93

**Dyeing properties of dyes:** The mordent and dispersed azo dyes were applied at 2 % depth on wool and polyester fabric respectively. Their dyeing properties are given in Tables 2 and 3. These dyes gave a wide range of colours varying from yellowish brown to reddish brown shades with good smoothness, brightness and depth on the fabric. The variation in the shades of the dye fabric results from both the nature and position of the substituent present on the diazotized compound. The light fastness values of the dyes are more consistent as shown in Table-4. The dyeing showed an excellent fastness to light, ranging from very good to excellent fastness to washing, perspiration and sublimation; however it showed poor rubbing fastness.

TABLE-2  
 RESULTS OF DISPERSE DYEING AND VARIOUS FASTNESS  
 PROPERTIES OF DYES ON POLYESTER

Dyes no.	Colour shades on polyester	Light fastness	Washing fastness	Perspiration fastness		Sublimation fastness	Rubbing fastness	
				Acid	Alkaline		Dry	Wet
D <sub>1</sub>	Dark brown	5	5	5	5	5	4	4
D <sub>2</sub>	Yellowish brown	5	4-5	4-5	5	5	4	4
D <sub>3</sub>	Reddish brown	5	5	5	5	5	5	4
D <sub>4</sub>	Dark brown	4-5	5	4-5	5	4-5	4	3-4
D <sub>5</sub>	Green	5	4-5	5	5	5	5	4
D <sub>6</sub>	Yellowish orange	5	5	5	5	5	4-5	3-4
D <sub>7</sub>	Yellowish orange	5	4	5	5	5	5	4
D <sub>8</sub>	Chocolate brown	5	4-5	4-5	4	4-5	4-5	4
D <sub>9</sub>	Lemon yellow	5	5	5	5	5	5	3-4
D <sub>10</sub>	Yellowish orange	5	5	4-5	5	5	5	4

A remarkable degree of smoothness after washing is observed. This may be attributed to good penetration and affinity of the dye molecule into fiber structure.

TABLE-3  
RESULTS OF MORDENT DYEING AND VARIOUS FASTNESS  
PROPERTIES OF DYES ON WOOL

Dyes no.	Colour shades on wool	Light fastness	Washing fastness	Perspiration fastness		Sublimation fastness	Rubbing fastness	
				Acid	Alkaline		Dry	Wet
D <sub>1</sub>	Dark brown	4-5	4-5	4	4-5	5	4-5	3-4
D <sub>2</sub>	Yellowish brown	4-5	4	4-5	4-5	4-5	4	3-4
D <sub>3</sub>	Reddish brown	4-5	4-5	4-5	5	5	4-5	4
D <sub>4</sub>	Dark brown	4-5	4	4-5	5	4-5	4	3-4
D <sub>5</sub>	Green	4-5	4-5	4	4-5	4	4-5	3-4
D <sub>6</sub>	Yellowish orange	4-5	4-5	4-5	4-5	5	4-5	3-4
D <sub>7</sub>	Yellowish orange	4	4-5	4-5	4-5	5	5	3-4
D <sub>8</sub>	Chocolate brown	4	4-5	4-5	4-5	4-5	3-4	3
D <sub>9</sub>	Lemon yellow	4-5	4-5	4-5	5	5	4-5	3-4
D <sub>10</sub>	Yellowish orange	4-5	4-5	4-5	4-5	5	4-5	3-4

TABLE-4  
ANTIBACTERIAL ACTIVITY OF CHROME DYES (D<sub>1</sub>-D<sub>10</sub>)

Dyes no.	Organism			
	<i>E. coli</i>	<i>S. aureus</i>	<i>S. typhi</i>	<i>B. subtilis</i>
D <sub>1</sub>	+	+	+	+
D <sub>2</sub>	+	+	+	+
D <sub>3</sub>	+	+	+	+
D <sub>4</sub>	++	+++	+++	+++
D <sub>5</sub>	++	++	++	+++
D <sub>6</sub>	++	+	-	++
D <sub>7</sub>	+	++	++	++
D <sub>8</sub>	++	++	+	++
D <sub>9</sub>	+	+	+	+
D <sub>10</sub>	++	+	+	+

Diameter of inhibition zone in mm; concentration 100 µg/mL

(-) = Inactive (10 mm and less); (+) = Weakly active (12-15 mm).

(++) = Moderately active (16-19 mm); (+++) = Highly active (22 mm and above).

The most prominent feature of these dyes is that the dye pattern treated with Cr(III) salt solution affords excellent shining shades of dyes. This might be due to the chrome complex formation on fiber matrix. The bacterial activities of chrome complexes of dyes were monitored against the plant pathogens. The results show that these dyes are inhibiting the bacteria about 70 to 75 %. The dye pattern of chrome treated dye may be suitable for humans. The study of pigmentation of selective dyes with vinyl polymer *e.g.* PMMA (polymethyl methacrylates) was carried out. Comparison of transmission (%) was done by measuring absorption maxima ( $\lambda_{max}$ ) of prepared acrylic sheets. It was observed that addition of above dyes imparts both colour as well as UV absorbent properties to the acrylic sheet, without affecting their properties. The results also show that the sheets are quite stable for prolonged time.

## Conclusion

Produced dyes have good fastness to light, sublimation and perspiration but show poor rubbing fastness properties. Comparison of above two dyes reveals that mordent dyes have better shades than disperse dyes. Moreover, above mentioned dyes can be used as pigments as well as UV light absorbers in PMMA (polymethyl methacrylates) sheets or pellets.

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