

THE "GERMAN BAN" - AN ECO-FRIENDLY PRESCRIPTION FOR THE COIR INDUSTRY

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In the recent past, a concern for the environment has created an interesting development in the field of wet processing of textiles which is of relevance to the coir industry too.

Use of synthetic dyes began in the latter half of the 19th century following Perkin's discovery of MAUVEIN which led to further development of synthetic dyestuffs be stowing bright shades and improved colour fastness properties. This scenario began changing in the 1960's with the awareness of the deleterious

act of the dyeing industry on the environment. It has been estimated that the worldwide consumption of dyes presently exceeds 7 lakh tonnes per annum. The German legislation has recently come into force from the 1st January 1995 pertaining to restrictions on the use of dyestuffs for various textiles which are likely to be in contact with the human body. As per the Consumer Goods Ordinance such textiles must not be dyed with specific Azo dyestuffs which are known or suspected to release harmful amines. This is because these amines are allergenic, carcinogenic and / or poisonous in nature. Table I depicts the list of banned harmful amines.

Approximately 70% of all dyes used in the textile industry are azo dyes which are brilliant, economical and render adequate fastness. Azo dyes appear in the following form of dyestuffs viz: Acid dyes, Basic Dyes, Direct dyes and other class of dyes including pigments dyes etc. Only 25% of the azo dyes have been banned as of now. However, enforcement of this German legislation which has come into

effect from 1st January 1995 has been deferred by 6 months. Therefore from 1st July 1995 onwards it will be prohibited to sell such products in Germany.

Although only Germany has imposed these eco regulations presently, it is expected that other European countries, Canada and some other developed countries are also expected to follow suit. Further the ban is likely to be extended to cover other toxic substances such as Penta Chloro Phenol (PCP), Formaldehyde, Heavy metal traces and pesticides. In this regard, as per the European Commission decision of 14th September 1994 (94/783/EC) use of PCP is already prohibited in Germany. The details of acid dyes of various brand names found to be problematic are listed in Table II. As regards basic dyes, there are about 250 basic dyes of various brand names in use today which are likely to be under the problematic category (details in Table III).

Approximately 440 Direct dyes under different brand names are in use presently of which some have been noted to be problematic. Details of direct dyes is furnished in Table IV.

Dyestuffs in Vogue in Coir Industry

The dyestuffs most commonly used in the coir industry today are listed below and it is desirable to develop a new range of suitable alternative dyestuffs which can impart the required shades and simultaneously be ecofriendly.

Dyes for Coir

Name	C.L. No.
1. Acid Dyes	
a) Acid Orange II H/c	15510
*b) Acid Milling Red G	22245
2. Basic Dyes	
*a) Auramine O	41000
b) Chrysoidine Y	11270
c) Rhodamine B	45170
d) Malachite Green	42000
*e) Magenta	42510
f) Methyl Violet 2B	42535
g) Basic Black 2	11825
f) Bismark Brown R	21010
3. Direct Dyes	
*a) Direct Black E	30235
*b) Direct Green B	30295
*c) Direct Fast Red 5B	23565
*d) Direct Borwn MR	22311
*e) Direct Catechine Brown G	36030
*f) Direct Blue 2B	22610
g) Chrysophenine G	24895

*Banned Dyes

It is apparent from the above table that there is no immediate threat to the coir industry as most of the basic and acid dyes which are used for obtaining common shades have been excluded from the ban at present. But it will be difficult to produce fast shades with these dyes and since almost all the commonly used direct dyes have been banned, it is necessary to find out the alternative dyes possibly from the reactive dyestuffs which are "safe" to use. As a precautionary measure it is advised that the use of the "safe" dyestuffs should be made only after obtaining the "safety data sheets" from the dyestuff manufacturers as during the preparation of Rhodamine B, Malachite Green etc. There are chances of the presence of increased levels of heavy metals such as lead and Zinc etc. which are considered to be toxic beyond certain limits. Therefore it is essential

to take necessary steps to meet the challenge and adopt environment friendly wet processing techniques in line with the demands from the export market. There will be a need to replace the benzidine based dyestuffs by mineral or pigment dyes. The use of acetic acid has also to be phased out and it is suggested that formic acid be used instead. Peroxide bleaching may also have an edge over the traditional chlorine bleach method.

Precautionary Measures Suggested for the Coir Industry

1. Dyestuffs should be procured from reputed manufacturers such as ATIC, ATUL, BAYER, CIBA, IDI, SANDOZ etc. in respect of production / processing of materials for export particularly to Germany.
2. Insist on providing of "Safety Data Sheets" for the dyes and textile auxiliaries procured. The Safety Data sheets will indicate whether the materials procured are free from amines and also include the latest list of prohibited chemicals.
3. Avoid purchase of dyes & chemicals sold in loose form.
4. Check the commercial name, C.I. number of each of the dye procured and ensure that they do not figure in any red list, negative list or banned list.
5. Use only the latest shade cards issued from reputed manufacturers (since these shade cards would have provided only the shades prepared using the permissible dyestuffs).

Several leading dyestuff manufacturers have started issuing lists of safe dyestuffs manufactured by them for example recently Sandoz India Limited has published a list of

Safe Textile Dyestuffs, manufactured by them (Table V). Similarly ATIC Industries Ltd has recently certified that they are not using intermediates which contain banned amine groups except p-Kresidin (which is used in the manufacture of Procion Navy Blue M-3r and H-3R and does not occur in the free form) in their manufacture of Vat, Reactive and Disperse Dyes.

The other alternative to synthetic dyes can be use of natural dyestuffs of plant origin. A list of such natural dyes is furnished in Table VI. However it is evident from the table that the yield of the dye is very poor from natural resources. The annual worldwide production of indigo is approximately 14,000 tonnes which necessitate the availability of almost 1.4 billion pounds of indigo leaves. Similarly, the yield of the red dye "cochineal" is about six pounds per acre of cacti. Production of a mere six million pounds of dye would require atleast cacti grown over one million acres of land. Besides, these natural dyes require mordants which comprise of heavy metals including Chromium, Tin, Iron, Copper etc. and the toxicity of the natural dyes have not been thoroughly evaluated. Thus it is unlikely that the present demand for dyes could be met with natural dyes although much research and study on the subject remains. The limitations on the application of natural dyes can be summed up as follows:-

1. Limited range of shades.
2. High cost of production.
3. Unrealistic requirement of agricultural surfaces.
4. Questionable Fastness level
5. Questionable reproducibility.
6. Questionable influence on environment
7. No toxicological data available.
8. Metal contamination in application (low fixation yield).
9. High waste volume in production (up to 98%).

Redlisted Chemicals having Relevance to the Coir Industry

Of late certain chemicals such as PCP, Formaldehyde and Heavy Metals have been noted to be in use in the finishing of Coir Products and these are also under the redlisted category.

Pentachlorophenol (PCP):- The possible source of PCP is the latex based finishing in which it is used as a dispersant. Benzothiazole has been suggested as an alternative to PCP.

Formaldehyde:- This is a chemical used as a preservative in the formulation of different types of auxiliaries. For example formaldehyde based cationic dye fixing agent etc.

Heavy Metals:- Metals like Arsenic (As), Chromium (Cr.) Cobalt (Co.), Copper (Cu), Lead (Pb), Mercury (Hg), and Zinc (Zn) are present in varying concentrations in different classes of dyestuffs viz acid, basic, direct and reactive. Chemicals used to impart flame retardant properties are also a probable source of heavy metals contamination.

Therefore it is the need of the hour to take necessary steps to adopt environment friendly safe wet processing methods to maintain the soaring exports of coir today. Coir Board is already initiating test facilities for procuring the requisite testing equipments viz the GLC etc to detect trace residues of red listed chemicals like PCP, Lindane etc in coir goods.

CONCLUSION

Environmental issues are gaining importance and it is in the interest of the Coir Industry to conform to the desired standards. It may well be understood that any organisation which offers products suited to the changed needs will stand a better chance and may be the only ones that survive and prosper. Thus

the new regulation can become a competitive advantage for companies who are willing to take up the challenge and work towards it. The path is indeed an uphill and difficult one but certainly not unsurmountable!

REFERENCES:

1. ECOFRIENDLY TEXTILES: Challenges to the Textile Industry Seminar held on 10th March 1995 at Bombay.
2. Colour Index, Volumes I-IV.
3. A text Book of Practical Organic Chemistry - A. I. Vogel 3rd Ed.

TABLE - 1
List of Banned Amines

S.No.	Banned Amine	S.No.	Banned Amine
1.	4- Aminodiphenyl	11.	3,3'- Dimethoxy benzidine
2.	Benzidine	12.	3,3'-Dimethylbenzidine
3.	4- Chloro-O-loludine	13.	3,3'- Dimethyl-4,4' diaminodiphenylmethane
4.	2- Napththylamine		
5.	0- Aminoazotoluene	14.	p- Kresidin
6.	2- Amino-4-nitrotoluence	15.	4,4' Methylene-bis (2-chloraniline)
7.	p- Chloraniline	16.	4,4' Oxydianiline
8.	2,4-Diaminoanisol	17.	4,4' thiodianiline
9.	4,4'- Diaminodiphenylmethane	18.	O- Toluidine.
10.	3,3'- Dichlorobenzidine	19.	2,4- Toluylendiamine
		20.	2,4,5,-Trimethylaniline.

Source:- Eco-Tex Consortium, Germany

TABLE - II
The C.I. Names, Commercial names and examples of Acid dyes with Common Brand Names

C.I. Name	C.I. No.	Commercial Names	Examples
		Amine Releasing	
Acid Black 29		Block B/BS.	Nylocid Fast Black B
Acid Black 94	30336	Black B/BV	Chromeleather Fast Black BV coriacid Black B
Acid Black 209	—	Black FC	
Acid Black 131	—	Black GBL/BGL Grey BGL	Irgalan Black GBL Lanasyn Black BGL
Acid Black 132	—	Black BRL/RBL	Irgalan Black RBL. Lanasyn Black BRL

Acid Orange 45	22195	Orange R	Acid Orange R Milling Orange R Fast Orange R
Acid Red 4	14710	Eosine G/Gc Pink B, Scarlet B/BL Red E	Anil Acid Fast Pink B Anil Acid Scarlet B Erolo Scarlet B Atul Acid Pink B
Acid Red 5	14905	Rhodine Gr Red R/RR	Erio Red R Azo Rhodine GR
Acid Red 73	27290	Croceine MOO/3B/3BA Scarlet DOO/3BC/R Red GR	Atul Croceline Scarlet Moo Acilan Croceline MOO Ensin Red Gr
Acid Red 118	26660	Cloth Red G2B	
Acid Red 150	27190	Cloth Red 2R, No.6 Scarlet	
Acid Red 264	18133	Brill Red 3 BL	
Acid Red 420		Scarlet Y-LFW	
Acid Red 24	16140	Ponceau G/RT Ponceau Scarlet	
Acid Red 85	22245	Red G	Atul Acid Milling Red G
Acid Red 114	23635	Red 2R/RS/BB	Coomassie Rd 2R Nylomine Red C-2R Sandolan Red RSI Nylosan Red F-RS Milling Red BB
Acid Red 115	27200	Red 2B	Eriosin Red 2B
Acid Red 128	24125	Red 3B Bordeaux R	Milling Bordeaux R Atul Acid Milling Red 3B
Acid 148	26665	Red BC	Emiacid clothe Red BC
Acid Red 158	20530	Red 3BL/ER	Supranol Red 3BL Teleon Fast Red ER
Acid Red 167	—	Red B	Polar Red B Millins Fast Red B
Acid Red 265	18129	Red BL	Sandolan Brilliant Red E-BI Milling Red BL
Acid Violet 12	18075	Red 2B/BB/BBA/A2B Rhodine/Carmin 4B	Acid Red A2B
Acid Brown 415	—	Brown S-GL	
		Poisonous	
Acid Orange 156	26501	Orange 3G Orange GL/GNS	Sandolan Orange P-GL Nylosan Orange C-GNS

C.I. Name	C.I. No.	Commercial Names	Examples
Acid Orange 165	28682	Orange 3RE	Acidol Orange 3 RE
		Carcinogenic	
Acid Dye	16155	Ponceau 3R/3RN	
Acid Red 26	16150	Ponceau 2R/RR/RL/FR	Acid Ponceau 2RL
Acid Violet 49	42640	Violet 3B/4B/6B	Erlosine Violet 3B Acilan Violet S4 BN Acid Violet
		Allergenic	
Acid Violet 17	42650	Violet 4B/4BS/R	Acid Brill Milling Violet 4BS Coomassie Violet R Sanolan Brill Violet E-4BNS

TABLE - III

Basic Dyes

There are about 250 basic dyes of various brand names in use today. Some of the brand names familiar in Indian Industry are given below:

Name of Company	Brand Name
BASF	Basacryl
Sandoz	Sandocryl

The C.I. names, Commercial names and specific examples of Common Brand names

C.I. Name	C.I. No.	Commercial Names	Examples
		Carcinogenic	
Basic Red9		Fusine,rosaniline Magenta N	
Basic Yellow	41000	Auramine O	
		Poisonous	
Basic Blue 3	51004	Blue BG/3G	A strozone Blue BG
		Blue Green 5G	Basacryl Blue Green X-5g Sandocryl Blue B3G
Basic Blue 7	42595	Blue BO	Victoria Pure Blue BO Lake Blue BO

Basic Blue 81	42595	Blue FGA	Victoria pure Blue FGA
Basic Red 12	48070	Phloxine G	Astra Phloxine G Extra Brilliant
		Pink AS Red BG	Pink AS
Basic Violet 16	48013	Violet 3R	Astra Violet 3R Extra Basacry
		Red BG/6B	Brill, Red BG Sandocry Fied B-6B
Basic Yellow 21	48060	Yellow 6G/7G	Astrazon Yellow 7GLL
			Sandocryl Brill Yellow B-6GL
Amine Releasing			
Basic Brown 4	21010	Bismarck Brown R	Atul Bismarck Brown R
(Solvent Brown 12)		Vesuvine B Brown AT	Astra Vestivine B
Basic Red 42 Basic Red 111		Red BJ Red KB/K/-2BN	

TABLE - IV

Direct Dyes

Approximately 440 direct dyes of various brand names are presently in use. Some of the brand name used in Indian industry are given below.

Name of Company

Brand Name

Atul

Atul Direct

Arlabs

Tezazol

Bayer

Sirus, Sirus Supra

Ciba

Chloroatine, Cupratine

Dinesh

Dinamine

Golden dyes

Goldamine Fast

ICI

Chlorazol, Durazol

Indokem

Incomine

Sandoz

Solar, Pyrazol

Texdyes

Texazol, Texirius

The C.I. names and commercial names are given below. No specific example or brand names given as all dyes are known by their commercial name.

C.I. Name	C.I. No.	Commercial Names
Amine Releasing		
Direct Black 29	22580	Black Ro
Direct Black 38	30235	Black E/2E/EC/EG/ER/RT
Direct Black 4	30245	Black W/RW/R/RX/D
Direct Black 154	—	Deep Black XA/AXN
Direct Black 91	30400	Copper Black R/RL/RLW Black CRL/RL
Direct Blue 1	24410	Sky Blue FB/FF6B Blue 6B/FF
Direct Blue 10	24340	Blue G/GS/DG
Direct Blue 14	23850	Blue 3B/3BX/NB-3BG
Direct Blue 15	24400	Sky Blue/Pure Blue Blue FB Sky Blue A/FF
Direct Blue 151	24175	Copper Blue B/BB/A
Direct Blue 160	—	Cooper Navy Blue R/RLL/RLW
Direct Blue 173	—	Copper Blue 3G
Direct Blue 192	—	Dialuminous Blue GF
Direct Blue 2	22590	Black BT/BH/ABC Nany Blue BH
Direct Blue 201	—	Blue BRL
Direct Blue 215	24115	Copper Blue GR
Direct Blue 22	24280	Blue RW/Blue 5G
Direct Blue 25	23790	Blue/Brill. Blue/New Blue 5B
Direct Blue 295	23820	Blue 2B-NB
Direct Blue 3	23705	Azurine 3R Violet 2B
Direct Blue 35	24145	Brill. Blue 3B/3BN
Direct Blue 6	22610	Blue. 2B/BB/2BX
Direct Blue 76	24411	Blue 2G/4G/6G
Direct Blue 8	24140	Azurine G Blue X., Blue G

C.I. Name	C.I. No.	Commercial Names
Direct Blue 9	24155	Blue BW/BN
Direct Blue 53	23860	Pure Blue BF Evans Blue
Direct Brown 1	30045	Brown 3G/3GR/CG/GN Chrome Brown G
Direct Brown 1:2	30110	Brown CN/CGN/5C Brown 3G
Direct Brown 101	31740	Chrome Brown LG/GL
Direct Brown 154	30120	Brown 3G/3GC/3GN
Direct Brown 2	22311	Brown M/MR/MH/MY
Direct Brown 222	30368	Brown 3GA
Direct Brown 25	36030	Catechine G/GS/GR
Direct Brown 27	31725	Brown/Chrome Brown/B/3G
Direct Brown 31	35660	Brown B/BP/TB/BCW
Direct Brown 33	35520	Catechine B/3B/BN
Direct Brown 51	31710	Bronze SH/G
Direct Brown 59	22345	Brown B/CB/BN/DB/BM
Direct Brown 6	30140	Brown/Congo Brown G/GR
Direct Brown 79	30056	Brown/Orange 3G
Direct Brown 95	30145	Brown B/BRL/BRLt
Direct Green 6	30295	Green B/BN
Direct Green 8	30315	Green G/GN/GC
Direct Green 8:1		Green G
Direct Green 85	30387	Dark Green BA
Direct Green 1	30280	Green /Dark Green/Black Green B/BG Green P/PLS, Black FE
Direct Orange 1	22370	Orange G/2G/GL/GR/R/RL
Direct Orange 10	23370	Orange/Coupling OrangeR/TR/PR
Direct Orange 108	29173	Viscose Orange A
Direct Orange 6	23375	Orange G/GG/GR
Direct Orange 7	23380	Orange G/TG
Direct Orange 8	22130	Orange R/RR/3R
Direct Red 1	22310	Red F/FC/FR/FN/FB
Direct Red 10	22145	Garnet H/B/BY Bordeaux GL/CGN Dark Red BR/R
Direct Red 13	22155	Bordaux/B/BR/BN/BW
Direct Red 17	22156	Congo Rubine Rubine, Rubine A/R
Direct Red 2	23500	Red 4B Purpurine/Benzopurpurine4B/4BA
Direct Red 21	23560	Red B Benzopurpurine B
Direct Red 22	23565	Red 5B, Purpurine 5B Purple R

C.I. Name	C.I. No.	Commercial Names
Direct Red 24	29185	Scarlet 4BA/BAS/4BSL
Direct Red 26	29190	Scarlet 8B/8BS/8BA
Direct Red 28	22120	Congo Red Congo Red 4B/RS
Direct Red 37	22240	Red B/Scarlet B/BL
Direct Red 39	23630	Scarlet 3B
Direct Red 44	22500	Rubine B Bordeaux Extra
Direct Red 46	23050	Red 8B, Purpurine 8B
Direct Red 62	29175	Orange R/RS/F3R
Direct Red 67	23505	Purpurine 4B Cotton Red N
Direct Red 7	24100	Red 10B, Purpurine 10B, Bordeaux B
Direct Red 72	29200	Scarlet 4BN/4SW
Direct Violet 1	22570	Violet N/MN/NN/R/3R
Direct Violet 12	22550	Violet R/O/OC/On
Direct Violet 21	23520	Corinth B
Direct Violet 22	22480	Violet LN
Direct Yellow 1	22250	Yellow G Chrysamine G
Direct Yellow 24	22010	Golden Yellow N Yellow CT
Direct Yellow 48	23660	Yellow TG
Others		
Developer 14 Oxidation Base 20	76035	Developer B/H/MTD, Metatoluenediar
Ingrain Blue 2/2	74160	Phthalogen Brill Blue 1F 3G Brill, Blue 3G

TABLE - V

List of "SAFE" Textile Dyestuffs of Sandoz (India) Ltd.

Acid	Chromes
SANDOLAM F YELLOW 4 GLI	OMEGA CHROME YELLOW KI
SANDOSILK F YELLOW 4 GLI	OMEGA CHR BORDEAUS BRI
SANDOLAN ORANGE N3GI	OMEGA CHROME F BLUE BI
SANDOSILK ORANGE 3GI	OMEGA CHROME BROWN EBI
SANDOLAN RHODAMINE EBI/	OMEGA CHROME BROWN 2RI
SANDOSILK RHODAMINE BI	LANASYN (1:2 METAL COMPLEX DYES.
SANDOLAN RHODINE - E2GLI	LANASYN YELLOW GLNI
SANDOLAN RED NRSI/	LANASYN YELLOW 2RLI
NYLOSAN RED FRSI/	LANASYN YELLOW 2GLNI
SANDOSILK RSI	LANASYN YELLOW 2 RLKI
SANDOLAN BR VIOLET E5BNI	LANASYN ORANGE LNI
SANDOSILK BR VIOLET 5BNI	LANASYN RED CF
SANDOLAN RED BROWN NVL/	LANASYN BORDEAUX SMBI
SANDOSILK RED BROWN VI	LANASYN DARK VIOLET RLI
SANDOLAN MARINE BL 2RI C	LANASYN NAVY BLUE SDNLI
SANDOSILK TURQUOISE EASI/	LANASYN GREEN 5GLI EXTRA
SANDOSILK TUROUOISE ASI	LANASYN BROWN 2 RLI
SANDOLAN BLUE EBRI/	LANASYN BLACK SDLI
SANDOSILK BLUE BRI	SOLAR/ DIRECT
SANDOPLAN NAVY N5RL 1/	SOLAR YELLOW BGI/
NYLOSAN NAVY NRBLT/	SANDOSILK YELLOW BGI
SANDOSILK NAVY 5RLI	SOLAR ORANGE 2GI
SANDOLAN BRILL GREEN EBI/	SANDOSILK ORANGE 2GLI
SANDOSILK BRILL GREEN BI	SOLAR BLUE 2GLNI
SANDOSILK BROWN GI	SOLAR BLACK GI
NYLOSAN BLACK WLI	DRIMARENE (REACTIVE DYES)
SANDOSILK BLACK WLI	DRIMARENE YELLOW 4 GLI
	DRIMAREN EORANGE 3 RLI

SANDOLAN MILL BLACK NBGI	DIMARENE SCARLET PRI DRIMARENE BLUE RLI DRIMARENE TURQUOISE PBI DRIMARENE VIOLET P 3RI DRIMARENE YELLOW P 2GI DRIMARENE YELLOW 3 RI.
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Other Dyes (1: 1) Metal Complex

VITROLAN BLACK WAI/ SANDOSILK BLACK WAI DRIMARENE YELLOW 3GLI DRIMARENE GOLD YEL 2RLI DRIMARENE BRILL RED 4BLI	DRIMARENE BRILL RED BLI DRIMARENE NAVY BLUE RBI DRIMARENE BLACK PBNI DRIMARENE BRILL RED 6BI DRIMARENE GREEN 2BI
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TABLE - VI

Yields of Natural Dyes

Dye	Source	Content
Madder	Rootbark	1.9%
Cochineal	Female Cochineal louse	1.8%
Indigo	Indigo plant leaves	1.5 - 2.0%
Saffron	"Crocus" Plant flower pistil	7.0%
Annatto	Roucone tree-seed	15.0%
Carotin	Carrot, red palm Oil, Pumpking Seed	<0.5%
Juglone	Black Walnut hulls	0.2%
Lac	Stick - lac	0.5 - 0.75%