STANDARDIZATION OF VEGETABLE DYES

Problems of Standardization

- Natural dyeing has the problem of standardization. In 1971 Rita Adrosko wrote about vegetable dyes in NATURAL DYES AND HOME DYEING, "Craftsmen are becoming increasingly enthusiastic about this out-dated and time-consuming process for one of the reasons that manufacturers rejected it because of difficulty of standardization. Natural dyestuffs produce offbeat, one-of-a-kind colors. No two dye lots are identical, each having subtle differences due to impurities peculiar to the particular plant material used.

- The problem of course with raw botanicals is that the numerous chemical ingredients that make up plants vary widely. Not only do the variations occur between plants of the same species, but also from part to part of the same plant so that, for instance, in madder the dye is contained in the roots, not the leaves. The type and quantity of chemicals present are affected by such things as soil, species, weather, time of harvest as well as the part of the plant used. The manner in which they are stored and processed also has a profound effect. Color varies greatly with plants grown in different areas, due to mineral content of the soil, and various other factors of growth.

Trial and Error methods

Dyers learned by trial and error what to pick and when and where to pick it. They passed down their knowledge from generation to generation often keeping trade secrets from outsiders. Dyers, of course, used color as a control. They kept trying to determine which plant, which part of the plant, which species, what growing conditions and what time of harvest would produce the color closest to the one they wanted, but they also had many other variables to worry about such as the water and utensils used. Dyes prepared in a tin pot give a color different than the same ones prepared in an iron pot. To obtain the desired color time after time, the dyer had to know all this. If he didn't get what he was looking for, he knew that something was wrong with the raw materials used or with the manufacturing process and had to figure out what and how to adjust it.

An effort to standardize Natural colors

- In an effort to standardize colors, dye plants were often cultivated rather than gathered wild. Many were grown commercially. In order to get a standard color from a particular species of dye plant 400 years ago, the farmer would have had to have worked empirically by selecting & cultivating plants that produced a dye that got closer and closer to the color he wanted. He would also have had to have tried growing the plants under different conditions to see what type of soil, etc. gave the best results. When he reached his goal, he would then have had to have maintained the results by always growing the same species under the same conditions using color as his control. By keeping good records and adjusting the variables, he learned by experience how to obtain the desired color, but it wasn't easy or exactly the same each time. Even today it is not possible to precisely match color from batch to batch, not even with synthetic dyes.

- To produce fully standardized eco-friendly vegetable dyes from potential herbal/vegetable resources, evaluation of natural colors for eco-friendliness, standardization of processes for various textile substrates, large scale production and development of commercial natural dyes, there are certain specifications that need to be followed. They are--

Specifications

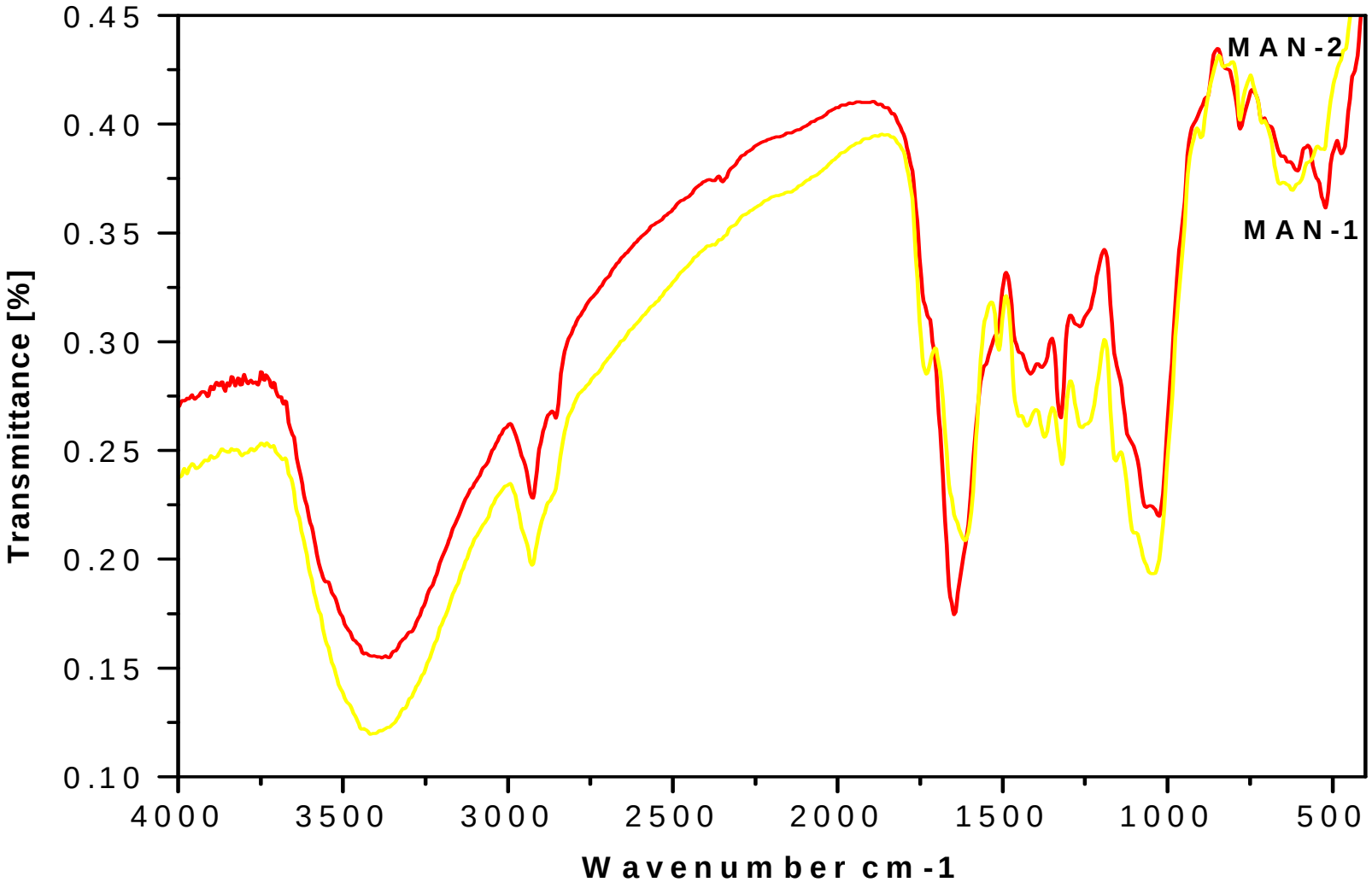
- 1.Color,
- 2. Appearance,
- 3. Optical density
- 4.Water soluble matter,
- 5. pH of water extract,
- 6. Ash content and
- 7.Colour component and its tinctorial value
- 8. Total suspended solid content

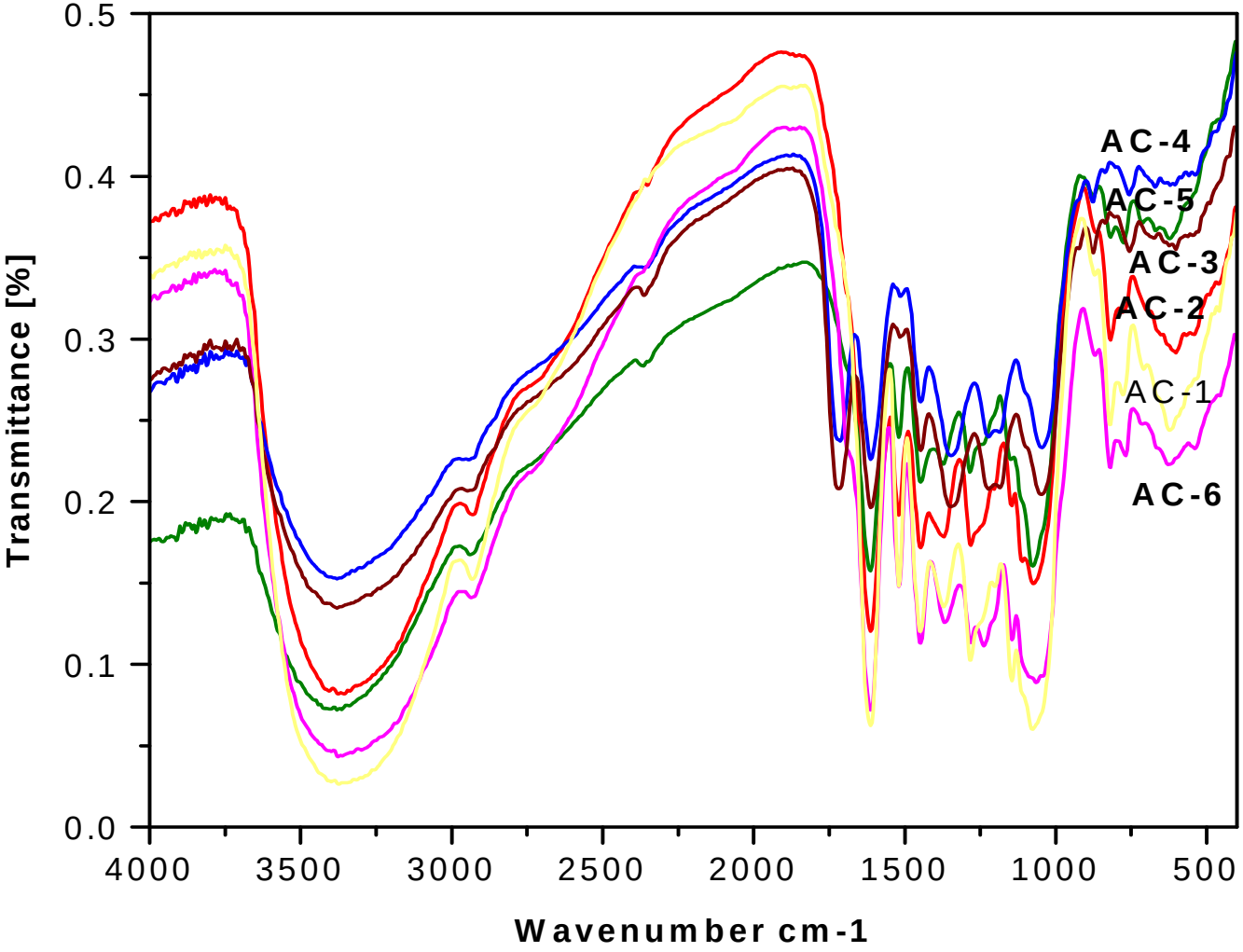
- Procedures for the extraction of coloring matter in aqueous medium has to be standardized at pilot and bulk scale plant. Shade cards having shades of fabric and dyed yarns having good light, wash and rub fastness need to be produced for each natural dye. But still the problem of reproducibility arises. Dye from one company does not necessarily give the same shade as the same dye from another company. Comparative study has been carried out for three dyes- 1. *Acacia catechu(* **Catechu***)*, 2.*Rubia cordifolia* (**Manjistha**) and 3. *Quercus infectoria(***Gall nut)**. Table –I shows the difference in their pH and total suspended solid contents in the dyes supplied by different companies. The dyes show that UV spectrum , Visible spectrum as well as FT-IR spectrum show difference which goes to show that there is definitely difference in their optical density, which is the root cause for their difference in dyeing ability and color. This exercise of standardization was carried out to confirm this fact.

TABLE- I COMPARATIVE STUDY OF pH and TOTAL SUSPENDED SOLIDS

Dye	Sample code	pH	TSS
Manjistha	Man-1	7.28	787.6 gm/Kg
	Man-2	6.04	112.9 gm/Kg
Acacia catechu	AC-1	6.46	180.0 gm/Kg
	AC-2	6.99	178.7 gm/Kg
	AC-3	5.34	74.3 gm/Kg
	AC-4	5.33	
	AC-5	6.16	426.5 gm/Kg
	AC-6	6.05	244.9 gm/Kg
Quercus infectoria	QI-1	4.33	107.2 gm/Kg
	QI-2	4.32	179.5 gm/Kg

COMPARATIVE STUDY OF FT-IR SPECTRUM

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0.4
0.3
0.2
0.1
0.0
Transmittance [%]
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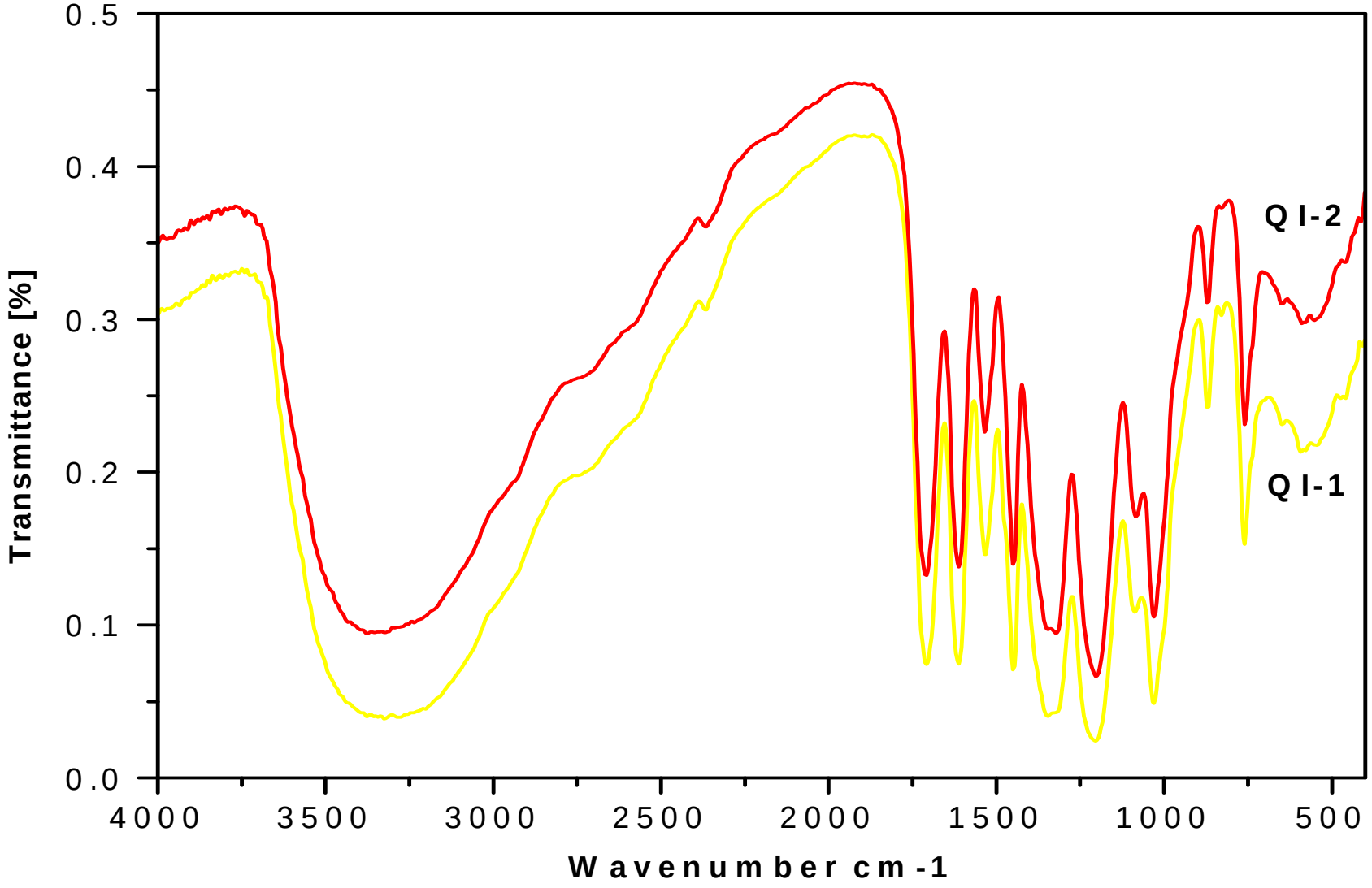
3500
3000
2500
2000
1500
1000
500
Wavenumber cm-1
AC-4
AC-5
AC-3
AC-2
AC-1
AC-6


0.5
0.4
0.3
0.2
0.1
0.0
Transmittance [%]
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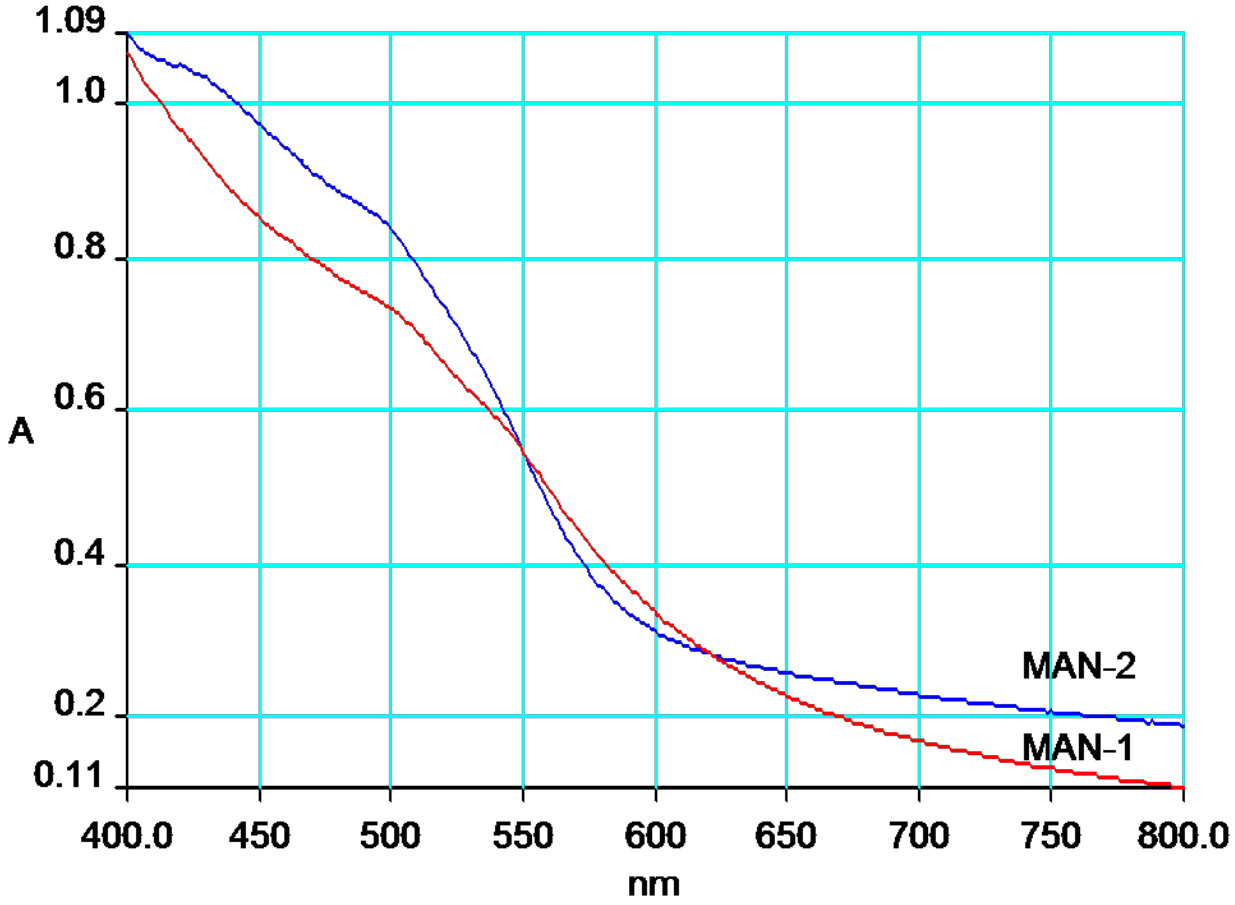
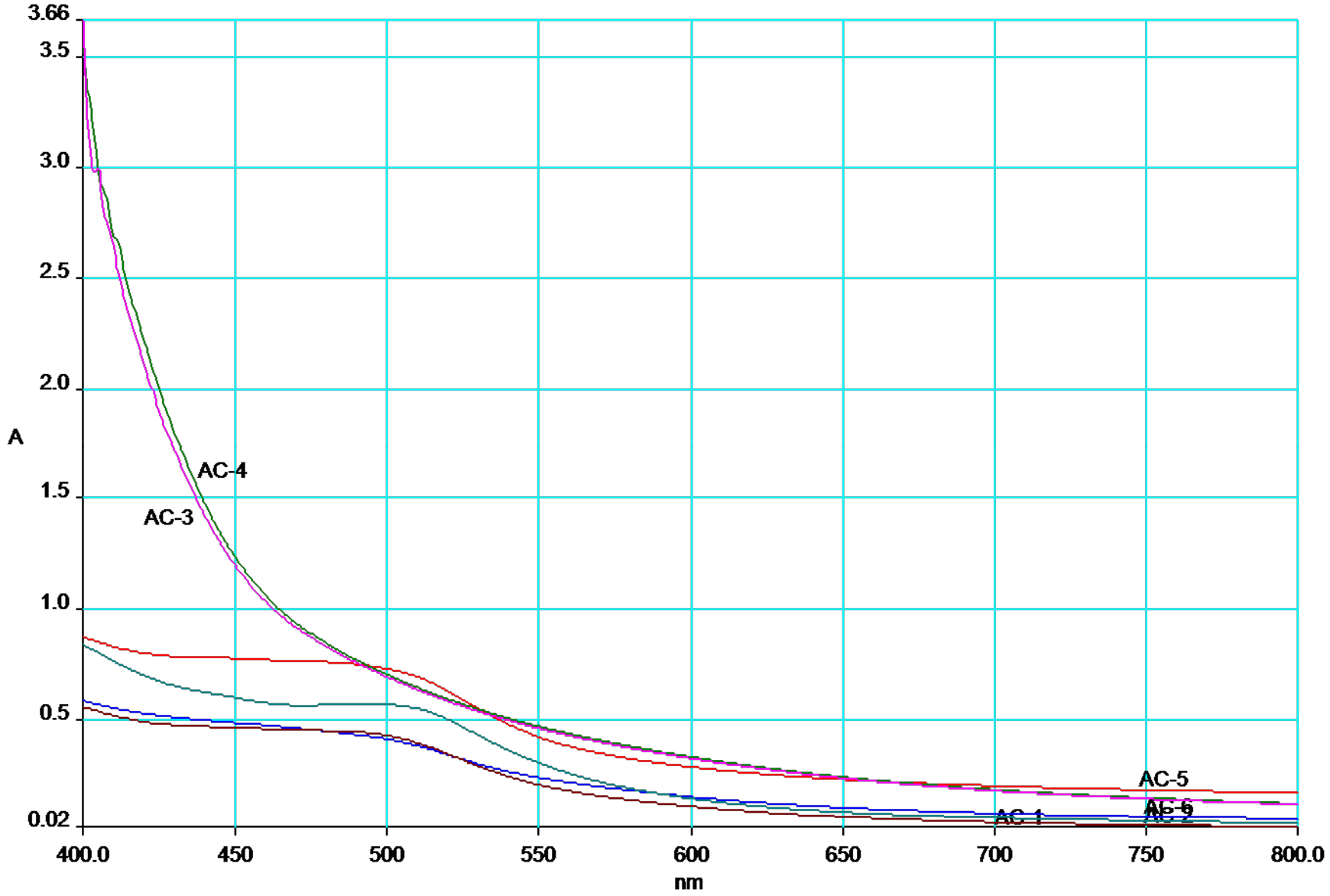
3500
3000
2500
2000
1500
1000
500
Wavenumber cm-1
Q I-2
Q I-1

COMPARATIVE STUDY OF UV SPECTRUM, VISIBLE SPECTRUM

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3.0
2.5
2.0
1.5
1.0
0.5
0.02
A
AC-4
AC-3
AC-5
AC-6
AC-1
AC-2
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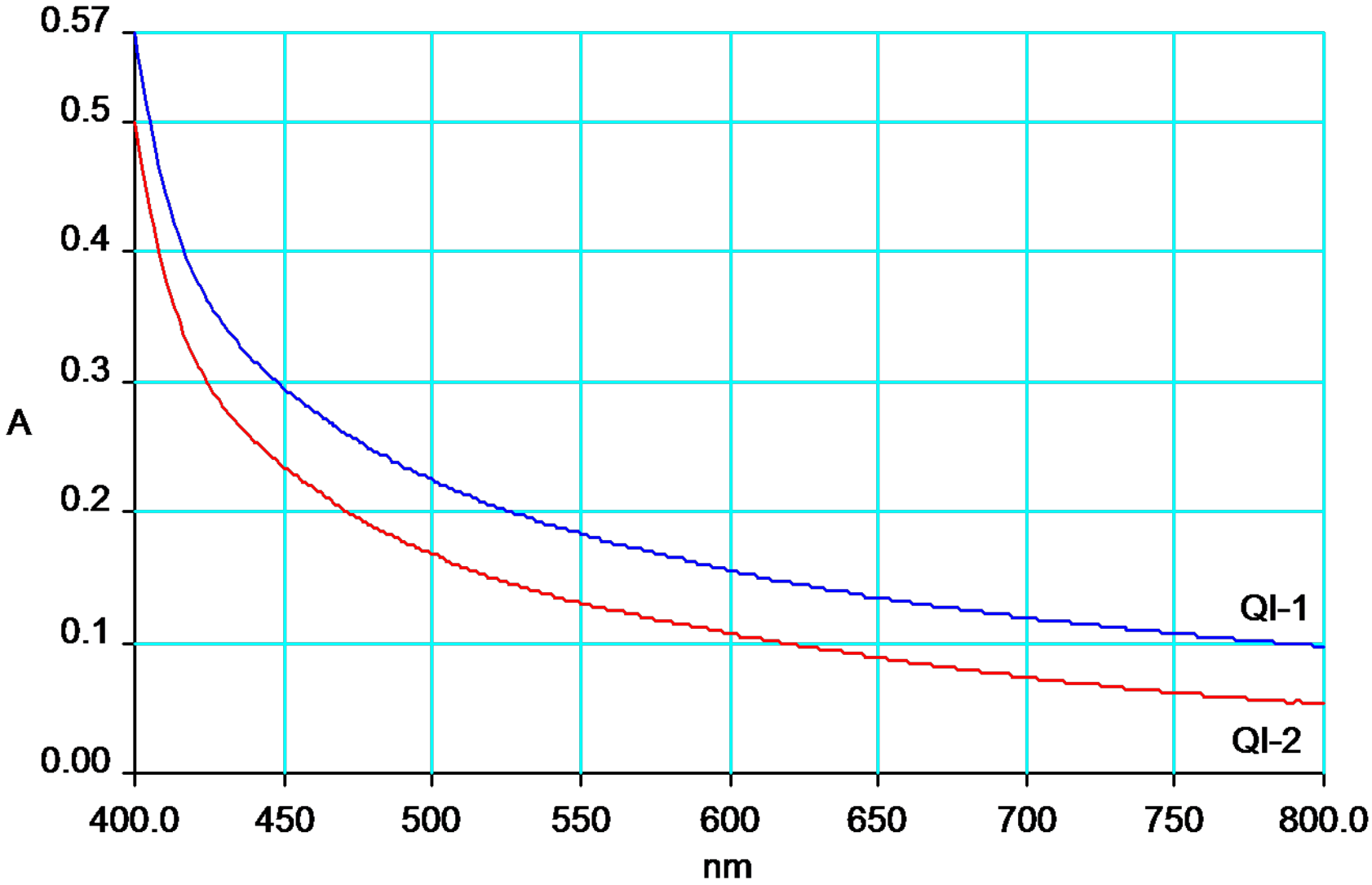
450
500
550
600
650
700
750
800.0
nm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0.2
0.1
0.00
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500
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600
650
700
750
800.0
nm
QI-1
QI-2

Quality Standards for Vegetable dyes

- Quality standards for vegetable dyes vary widely, so it is necessary to first contact an importer to find out what they are looking for. The problem arises with standardization of the colors as no two dye lots are identical, technicians in the pharmacology, food and textile industry loathe this lack of consistency.

- For attempting repeatability of shades for textile dyeing the recommended procedure as mentioned in the earlier chapters should be followed strictly and it should be always practiced that **:**

- Use only S.S. Dye-bath

- ii. Water hardness should not be more than 300 ppm.

- iii. Yarn water ratio should be 1:20