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# Spectrophotometry of floral extracts

SIR C V RAMAN

ABSTRACT

Spectrophotometer records of the absorption spectra of the acetone extracts of the pigments of four flowers, respectively red, purple, blue and yellow in colour, are reproduced with appropriate comments on the features which they exhibit.

## 1. Introduction

Many flowers which present attractive colours exhibit an intense absorption over extensive regions in the spectrum. It is not easy in such cases to determine by simple observations *in vivo* the nature of the pigmentary materials responsible for the observed colours. The extraction of the pigment from the petals by appropriate solvents, e.g., acetone, followed by spectrophotometric examination of the extract diluted to such extent as may be found necessary is very helpful in such cases. Likewise, a similar procedure may be followed with advantage in the case of flowers exhibiting very delicate colours, the spectral character of which is not easily acceptable to direct observation. Extended studies of this kind with many flowers should be of help for a fuller understanding of the origins of floral colour in general. The present communication reports the results obtained in a few typical cases of this nature.

## 2. *Hibiscus rosa sinensis*

This is a widespreading shrub, 5–8 feet high with bright shining thick foliage. It is constantly in bloom with large brilliant scarlet-red flowers which have pretty columns of pistil and stamens projecting from their centres. The shrub with its flowers has an attractive appearance as seen from a distance and hence is very effective as an ornamental hedge. Viewed through a direct-vision spectroscope, the flowers exhibit wavelengths greater than 600 m$\mu$ in full strength, while shorter wavelengths suffer a practically complete extinction. Immersion of the petals in acetone results in a rapid extraction of the colour. Viewed through a spectroscope, a 5 cm column of the extract exhibits visible absorption bands in the

yellow and green sectors followed by a strong general absorption in the blue region. Figure 1 is a spectrophotometer record obtained with an absorption cell 2 cm thick. The numbers entered in the figure are the wavelengths in Å units. It will be seen that apart from the three absorption bands in the yellow, green and blue-green characteristic of florachrome B, two other bands are noticeable in the blue and violet regions of the spectrum. It may be inferred from this that besides florachrome B which is responsible for the red colour, there is also present a yellow pigment which has a strong absorption in the short-wave region of the spectrum. This inference receives support from the fact that the colour of the acetone extract does not fade away completely after 24 h as in the case of the extracts from red or crimson roses but exhibits a residual yellow. It should, no doubt, be possible to separate the red and yellow pigments by chromatographic methods.

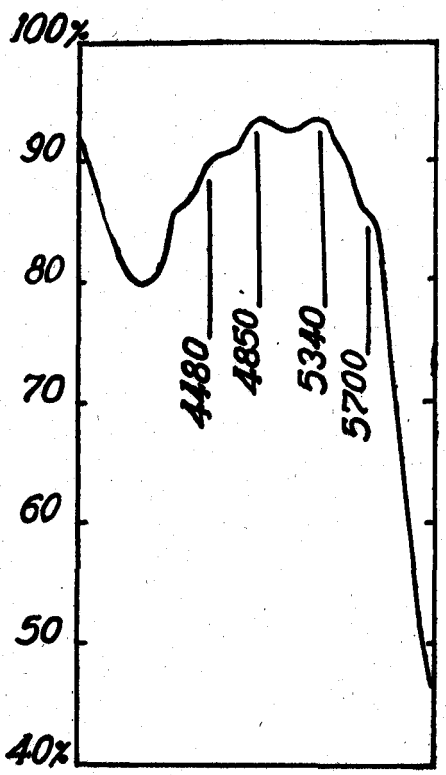


**Figure 1.** Absorption spectrum of the red *Hibiscus*.

## 3. *Lagerstroemia indica purpurea*

This shrub belongs to the botanical class *Lythraceae* and is popularly known as a crape myrtle. It is a deciduous shrub 6–10 feet high with small leaves and is very pretty in bloom with soft, fringed, showy flowers arranged in long erect sprays. The colour is readily extracted from the material by immersion in acetone. The spectrophotometric record of absorption by a cm column of the acetone extract is reproduced as figure 2.

The record shows some similarity to that of the acetone extract from the reddish-purple ground-orchid. *Spathoglottis plicata*, which *in vivo*, exhibits the typical spectrum of florachrome B with absorption bands appearing conspicuously in the yellow, green and green-blue regions of the spectrum.

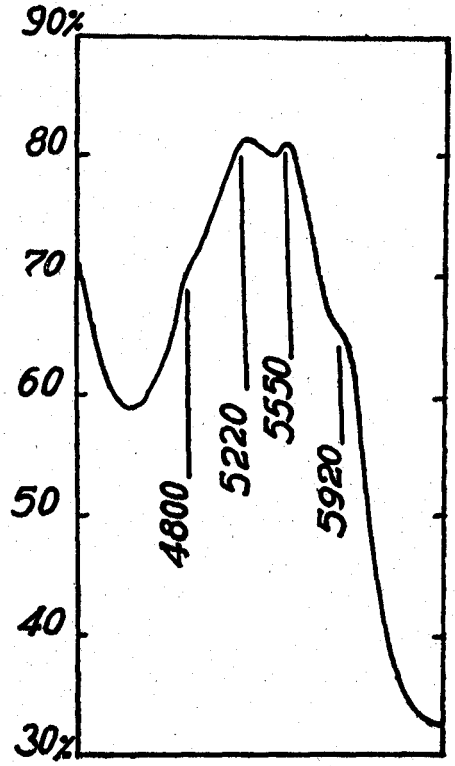


**Figure 2.** Absorption spectrum of the purple *Lagerstroemia*.

## 4. *Jacquemontia violacea*

This belongs to the botanical order *Convolvulaceae*, and is a small very free-blooming creeper with small cordate leaves. The flowers are also small and bell-shaped. They are blue in colour and are borne plentifully in all seasons. Hence, the creeper is sometimes referred to as *Ipomea semperflorens*. The colour may be extracted by grinding a sufficient number of the petals with acetone in an agate mortar.

Examined *in vivo*, the flower shows quite conspicuously the absorption bands in the yellow and in the orange-red regions in the spectrum which are responsible for the blue colour which it exhibits. A 5 cm column of the acetone extract exhibits a purplish-blue colour which is spectroscopically revealed as due to a conspicuous absorption-band covering the yellow region of the spectrum, a less conspicuous diffuse band in the red and a general weakening of the green region of the spectrum. The blue region in the spectrum is transmitted with fair strength. These features are recognisable in the spectrophotometer record of the absorption by a cm column of the acetone extract reproduced as figure 3. The spectral behaviour of the flower thus definitely belongs to the class florachrome A.

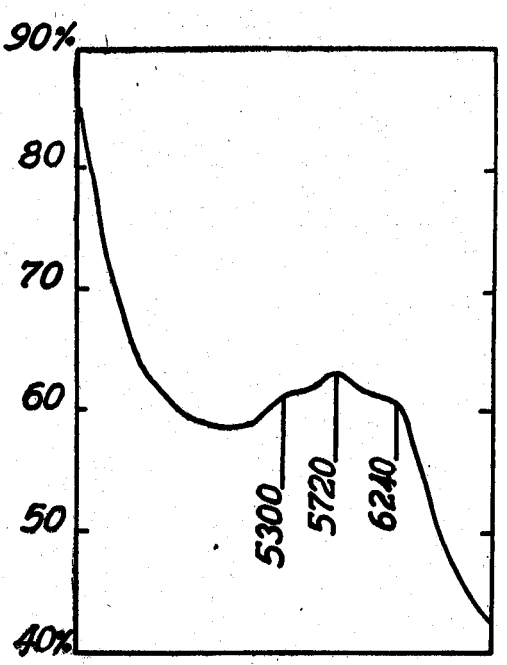


**Figure 3.** Absorption spectrum of the blue *Jacquemontia*.

## 5. *Tecoma stans*

This is a large shrub belonging to the botanical class *Bignoniaceae*. It is a very hardy quick grower attaining a height of about 10 feet. The foliage is handsome, consisting of graceful pinnate leaves. The shrub is commonly planted for screening compound walls or as hedging. The flowers are golden-yellow in colour, large, funnel-shaped and widely expanded and appear as clusters in terminal branches. The colour is readily extracted from them by immersion in acetone. Examined *in vivo*, the flowers exhibit a practically complete extinction of the shorter wavelengths in the spectrum upto about 510 m$\mu$, while the rest of the spectrum appears in full strength. The acetone extract exhibits the same spectroscopic behaviour. Figure 4 reproduces a spectrophotometer record of the

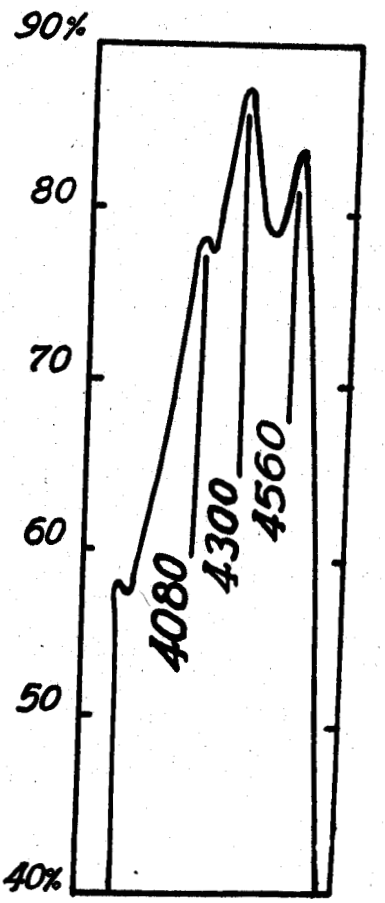


**Figure 4.** Absorption spectrum of the yellow *Tecoma*.

diluted extract. It shows three bands in the blue-violet region of the spectrum, indicating that the pigment may be identified as a carotenoid.

The records reproduced above were made in the Instruments Section of the Indian Institute of Science, to the authorities of which institution, the thanks of the author are due.