

Floral colours and the physiology of vision— Part V. The blue of the Jacaranda

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The tree whose full botanical name is *Jacaranda mimosifolia* was originally a native of Brazil, but has been introduced into many tropical and sub-tropical countries. It is now a common sight in Indian gardens and is also a favourite avenue tree in towns and cities. Its foliage is as finely cut as a fern, symmetrical and elegant. But the beauty of the foliage is far excelled by the splendour of the flowers which the tree bears in profusion during the months of March to May in each year. Each fresh green stem growing from the old wood terminates in a large loose cluster of violet-blue flowers in great number, forming a spray of colour. An avenue of such trees is an unforgettable sight when from end to end every tree is swathed in blue. Illustrations showing the foliage, flowers and buds of the Jacaranda appear in the two books quoted in the preceding part of the memoir.

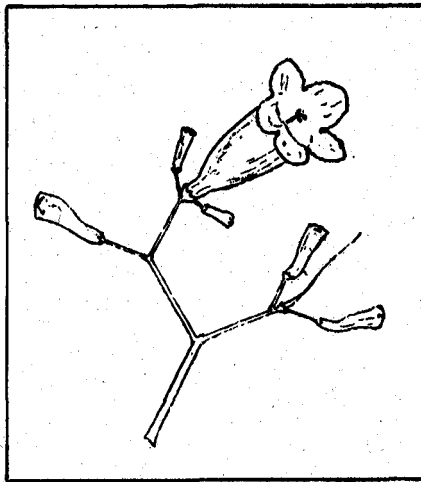


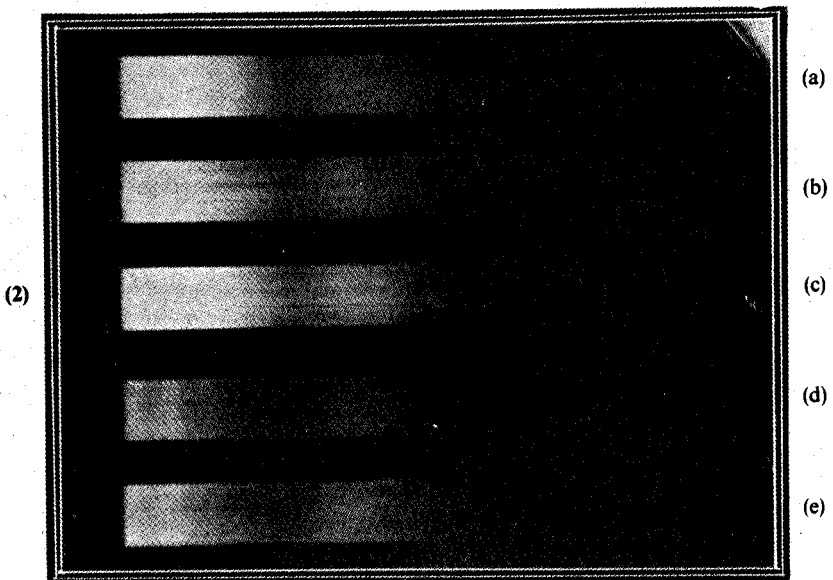
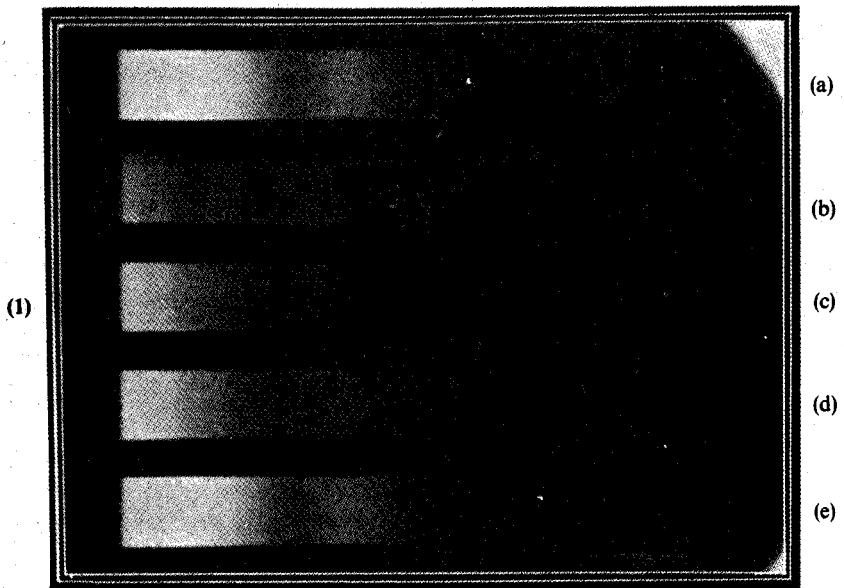
Figure 1. Flower and buds of Jacaranda.

Figure 1 in the text is a sketch of a single flower and a few unopened buds attached to it.

The unique character of the floral display of the Jacaranda invests the origin of the blue colour of its buds and flowers with much interest. Each flower is a bent swelling tube, about 5 cm long, which divides into five unequal lobes, two upcurving and smudged with white and the other three large and straight. As a result of this tubular shape, the colour exhibited by the flower arises in two different ways, firstly from the light which is diffused backwards by the outer surfaces of the tube and secondly from the light which was passed through the tube, suffering absorption and diffusion twice in its path. Both processes result in making the colour appear deeper than it would be after passage through a single layer of the absorbing material. It is worthy of note that the buds of the Jacaranda exhibit a deeper colour than the flowers. This may be ascribed to the concentration of the absorbing material in a smaller space. Even after dropping from the tree, the colour of the flower does not fade away. On the other hand, the colour deepens as the material dries up.

Examination of the spectral composition of the colour arising in either of the two ways stated above shows that the origin of the colour to be, firstly, a weak absorption in the yellow region of the spectrum in the wavelength range 570 to 590 $m\mu$, and another weak absorption in the spectral region between 630 and 640 $m\mu$. As the result of these two effects, the orange sector in the region of wavelengths between 600 and 620 $m\mu$ stands out as a bright band with darker regions on either side of it. The rest of the spectrum including the violet, blue and green sectors has its normal appearance without any change in relative intensities which could be visually detected. Thus, the blue colour of the Jacaranda flowers is ascribable to a weakening of two rather narrow sectors in the spectrum, viz., the region of the yellow and a region midway between the orange and the red.

The weakness of the absorptions and the non-uniformity of the photographic sensitivity of the panchromatic films make it rather difficult to portray them satisfactorily in a spectrogram. Better results are, however, obtained using material detached from an unopened bud, which as stated earlier exhibits the colour more vividly than the flower. Figures 1(a), (b), (c), (d) and (e) in plate I reproduce the spectrograms thus obtained; figure 1(a) and (e) are comparison spectra of the light-source employed, while (b), (c) and (d) reproduce the spectrograms recorded with the absorbing material covering the slit of the spectrograph and with three different exposures. The red end of the spectrum in each case is on the extreme left, while the violet is on the extreme right. The features mentioned above can be recognised in the reproduced spectra when they are compared with those of the light-source appearing as the first and the last of the series of five spectrograms.



Figures 1 and 2. 1. Spectra of blue Jacaranda with comparison spectra. 2. Spectra of the "Heavenly Blue" with comparison spectra.

Plate I

Summary

Spectroscopic observations show that the blue colour of the flowers of the Jacaranda tree is ascribable entirely to two weak absorption bands, one appearing in the yellow and the other midway between the orange and red sectors, the rest of the spectrum of white light showing no other observable variation from its normal distribution of intensity.