figures entered are wavelengths in angstroms. The absorption is manifested only in the blue region of the spectrum and the three peaks which appear in the record are an indication that the pigment which gives the characteristic golden-yellow colour to the extract belongs to the well-known class of organic compounds known as the carotenoids.

4. Explanation of the Colour Variations

The features noticed in the recorded curve of absorption appearing as Fig. 1 enable us to give a reasonable explanation of the great range of colours actually exhibited by roses. The factor which is different for the roses of different colour is the quantity of pigmentary material present in the petals. On the basis of such variation, it is possible to deduce the results to be expected and compare them with the actual facts of observation.

We may begin with the cases in which the pigment is present in minimal quantities. It is evident from Fig. 1 that in such cases, the absorption of light by the petals would be principally observed in the range of wavelength from 500 mμ to 550 mμ and that it would be much less both at greater and smaller wavelengths, becoming altogether insensible as we approach the red end of the spectrum. Examination of pink roses held in bright light through a pocket spectroscope discloses just such a situation. Further, it is found that the deeper the pink colour of the rose, the greater is the absorption noticeable in the green sector of the spectrum between 500 mμ and 550 mμ. But both the red and the blue regions of the spectrum persist.

We may next consider the cases in which the pigment is present in substantial quantities, sufficient to make the absorption by the petals completely effective except in the regions of the spectrum where the absorptive power is quite small. Referring again to Fig. 1, it will be seen that in such cases, the light which escapes such absorption could appear only at the extreme red end of the spectrum, and the rose would appear of a deep crimson colour. With less pigment available, wavelengths upto about 600 mμ could escape complete absorption and the colour of the rose would then be a bright red instead of a deep crimson. When the quantity of pigment available is still smaller, wavelengths between 570 mμ and 600 mμ would commence to appear in the light diffused by the petals and the colour of the rose would alter from red to scarlet. With further diminution of the quantity of pigment available, the light diffused by the petals would extend further towards still shorter wavelengths and the colour of the rose would alter from scarlet to orange. Actually, when orange roses are viewed through a pocket spectroscope, we find that the spectrum from the extreme red upto 550 mμ comes through, while shorter wavelengths are absorbed. In all these cases, the blue region of the spectrum is scarcely to be seen.

The author has not had an opportunity of examining roses which have been described as exhibiting purplish hues. If blue roses were ever forthcoming, they would assuredly exhibit the spectrum of Florachrome A, with its characteristic bands of absorption in the red, yellow and green regions.

The spectrophotometer records reproduced above were made in the Instruments Laboratory of the Indian Institute of Science, to the authorities of which the author's thanks are due.

FURTHER CHARACTERISTICS OF FLORACHROMES

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THE presence of floral pigments and their separation and classification into florachromes as Florachrome A and Florachrome B, have been demonstrated by Sir C. V. Raman.[1] This has been a revolutionizing concept, from the older and original concept of anthocyanin pigments, in floral pigmentation.

Recently, the characteristics of the florachromes on spectrophotometry has been demonstrated,[2] which confirms the observations presented initially.[1]

The original concept that the difference in the basic pigmentation being due to mere pH changes cannot be readily accepted because at

no stage does a red flower turn blue, on carrying out finely graded stage-wise alkanisation of the environment.

Also in flowers wherein due to genetic mutation the same petal bears spots of different colours, if the changes in colour were due to pH changes, it is hard to accept how, the same sap which circulates in the interstitial spaces of the petals with the pH of the sap during its circulation through a petal being constant, the colours could be different from spot to spot on the same petal.

found to be the best after trial of numerous other combinations for the selection of solvent systems, it came out that Florachrome A from blue flowers had a poor chromatographic motility, the R_f value being 0·350 to 0·355, while the Florachrome B from red flowers had a high degree of chromatographic motility, the R_f values being 0·90 to 0·96. This vast difference in the R_f values shows their difference in physico-chemical behaviour.

Furthermore, chromatography proves the presence of both florachromes in the same petal as envisaged earlier.[2] Paper chromatography

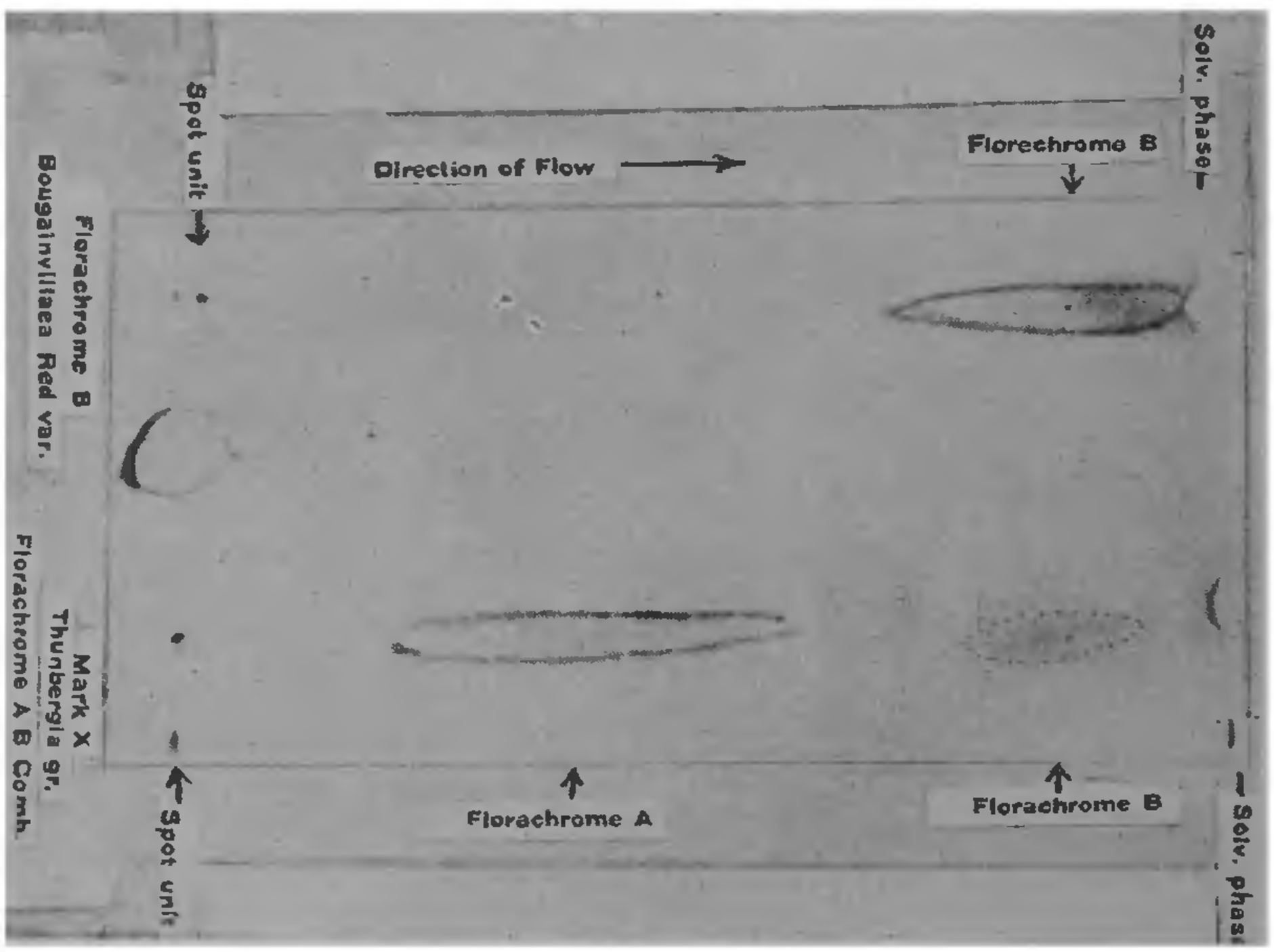

FIG. 1

Also, whatever their basic chemical configurations, although these are similar as demonstrated earlier, in the exposition of the chemical characteristics of the florachromes,[1,2] their class behaviour as seen biologically and physicochemically is different which would warrant their being placed in two separate categories as Florachrome A and Florachrome B. Chromatography, which is a basic chemical technology, for differentiating substances according to their motility and R_f values confirms the previous statement.

On chromatography, using both T.L.C. and paper chromatography methods, and a solvent system of acetone : H_2O (1 : 1), which was (Acetone : H_2O 1 : 1) of *Thunbergia grandiflora* var violet, which shows a pinkish-blue colour, showed the presence of both the florachromes as seen by their R_f values (Fig. 1, X). This not only shows that both florachromes can exist in the same petal, but that they could be separated by chromatographic methods. This shows the definitive presence of two classes of floral pigments Florachrome A and Florachrome B, as seen by their difference in physico-chemical behaviour.

1. Raman, Sir C. V., *Curr. Sci*, April 20 1969, 38, 179 and Presidential address : Indian Academy of Sciences, Ahmedabad, 22nd December, 1968.
2. —, *Curr. Sci.*, October 5, 1969, 38, 451.