being 750–570$\mu\mu$ (Fig. 1). It has been found by us that Beer's law holds for these mixtures and a straight line relation is obtained between the change in the logarithms of the extinction coefficient K of the mixture and the percentage of carotin, at a wave-length of 470$\mu\mu$. Curves 1 and 2 in Fig. 1 have been obtained with

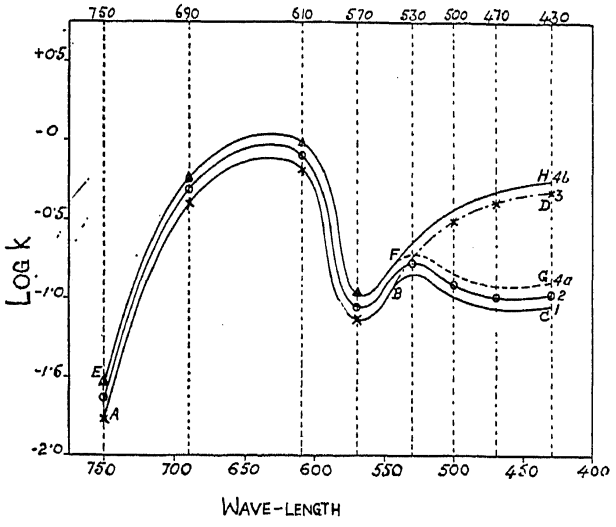

FIG. 1

Typical colour curves of chlorophyll solution in 80 per cent. methyl alcohol. Curve 1, (A B C) 4 mg. in 100 c.c. Curve 2, 6 mg. in 100 c.c. Curve 3, (A B D) 4 mg. of chlorophyll in 100 c.c. with 1·2 per cent carotin as an impurity. Curve 4*b* (E F H) drawn from observational readings of a test sample of chlorophyll. Curve 4*a* (E F G) the ideal curve for the same sample after comparing with the normal curve.

chlorophyll solutions in 80 per cent. methyl alcohol, containing in 100 c.c. 4 mg. and 6 mg. respectively. As Beer's law holds, the two curves are parallel. Curve 3 has been obtained with a solution of 4 mg. of chlorophyll in 100 c.c. and contains 1·2 per cent. carotin as an added impurity. Curve 4b is plotted from the observations on a test sample of chlorophyll. From a perusal of the region of deviation from the normal shape (Fig. 1, A B C), an ideal Curve 4*a* can be drawn and the actual change in log K caused by the carotin in this absorption region can be measured and the percentage of carotin read off from a calibration curve.

By the above procedure, it has been possible to detect carotenoid impurities in chlorophyll solutions down to a concentration of 0·05 per cent. The method of colour measurements and purity tests described here for chlorophyll solutions is applicable to other substances following Beer's law. The method has been specially useful in the laboratories in maintaining the purity of certain culture solutions by comparing their colour curves at regular intervals.

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[1] B. N. Singh and N. K. Anantha Rao, *Plant Physiology*, April 1937.

Utility of Leaf-tip Smear Technique

FOLLOWING the method of J. T. Baldwin,[1] tips of very young leaves about 1 mm. in length from the apex were selected from the youngest terminal bud, they were put in Carnoy's fixative (chloroform-acetic acid-alcohol) for about 10 minutes, were passed through a mixture of 95 per cent. alcohol and concentrated HCl in equal proportion for not more than 5 minutes, they were again dipped in Carnoy's for 5 minutes. Now the leaf-tips were put in a drop of aceto-carmine on a slide, with the help of a scalpel these leaf-tips were torn and put under a coverglass. With uniform and gentle pressure of the scalpel on the coverglass the leaf-tips were crushed uniformly and the slides were then passed over a flame three or four times, taking care not to boil the aceto-carmine, and each time a slight pressure was applied on the coverglass to spread the smear uniformly. The slides were ringed carefully and stored in a cool place in the dark for three or four days when the nuclear stains were found to have developed satisfactorily. The slides were then made permanent according to Barbara McClintock's[2] method. The smears showed all the phases of the somatic mitosis as in Fig. 1, and in some cases the chromosome-counts were possible.

The advantage of this leaf-tip-technique is that in a short time all the phases of the nuclear division can be demonstrated to beginners in

FIG. 1

Stages of mitosis under app. objective 2 mm. eye piece. × 4 6.

cell-study. It is also a time-saving process. Young leaf-tips from the terminal buds can be easily collected all the year round whereas it becomes difficult in some cases to germinate the seeds for root-tip study and some plants take a long time to flower from the vegetative stage. Moreover, flowers are not formed all the year round.

A recent instance of the utility of this method may be cited. Two specimens of *Holarrhena antidysentrica* (vern. *Kurchi*) were sent to our laboratory from the Royal Agri-Horticultural Society at Alipur. One of the specimens was suspected to be a new variety as it never set seed and usually flowered one month later than the other. On examination of the leaf-tips of both the specimens it was found that the chromosome numbers were the same in both, and thus it can be concluded that both the plants belong to the same species. It is hoped it will have great application in the field of genetics where the counting of chromosomes play such an important part.

In conclusion I beg to express my grateful thanks to Dr. S. R. Bose, Professor of Botany, for his guidance and helpful suggestions.

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July 31, 1940.

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[1] Baldwin, J. T., "Chromosome from leaves," *Science*, 1939, **90**, 240.

[2] McClintock, B., "A method for making aceto-carmin smears permanent," *Stain Technology*, 1929, **4**, 53.

A Sterile Mutant in Safflower (*Carthamus tinctorius* L.)

DURING the year 1938–39 selfed seeds of safflower I.P. 1 were sown in pots and the seedlings transplanted in the field unlike the usual practice of sowing the seeds directly in the field. The resulting plants, sixteen in number, were poor in growth and yielded only a few seeds each under conditions of open pollination, there being no seed setting under bag in any case. Seeds from these 16 plants were grown separately in the field during 1939–40. Early in the growth of the seedlings, one culture was marked by the presence of a few peculiar plants with thick and twisted stems. As these plants grew up, they developed other peculiarities which clearly distinguished them from the normal plants. The stems, besides being thick and twisted, were unbranched, bore thick and leathery leaves which were larger than those on the normal plants, the average length and breadth of leaves on these plants being 19·44 and 8·23 cms. and those of the normal 16·01 and 6·35 cms. respectively (Fig. 1). Each of these abnormal plants produced a single, solitary, terminal capitulum which did not open and failed to set seed. On dissection, the capitulum was found to be devoid of florets, but it merely contained white bristles