FLUORESCENCE, PHOSPHORESCENCE AND SELECTIVE FLUORESCENCE POLARIZATION SPECTRA OF AMINOPYRIDINES

FLUORESCENCE and phosphorescence spectra of 2-, 3- and 4-aminopyridines have been studied at liquid nitrogen temperature in the solid solution. Fluorescence spectra in solution at room temperature have been recently reported[1] when our work was in progress. The fluorescence and phosphorescence maxima for the three isomers are given in Table I.

Absorption spectra due to the spin forbidden electronic transition (singlet-triplet) corresponding to the observed phosphorescence have also been investigated, the data are shown in Table I.

TABLE I

	2-aminopyridine	3-aminopyridine	4-aminopyridine
Fluorescence maxima (in mμ)	345	350	?25
Phosphorescence maxima (in mμ)	420	450	360
Singlet-triplet absorption maxima (in mμ)	370	400	..
Longest wavelength singlet-singlet absorption maxima (in mμ)	296	302	270

The separation between the absorption (singlet-singlet) maximum in solution and the wavelength of maximum fluorescence as well as that of absorption (singlet-triplet) maximum and phosphorescence maximum is found to be quite large. This possibly shows that the equilibrium configuration in the excited electronic state is quite different from that of ground state.

It is expected that the longest wavelength absorption in these pyridine derivatives may be a superposition of two transitions, *viz.*, $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$. It was thought that the method of selective polarized excitation in solution could be employed to reveal their existence. The value of p, the polarization in the absence of extrinsic causes of depolarization, depends solely upon the angle λ determined by the direction of the transition moments in absorption and emission concerned. If a sufficiently dilute solution is employed in a medium of high viscosity, all such extrinsic causes may be considered absent and the plot of observed polarization against wavelength of irradiation constitutes the selective polarized excitation spectrum.[2] The limiting values of these polarization ratios are ½ for parallel and 1/3 for perpendicular direction of transition moment. Such a plot obtained for dilute solutions of 2- and 3-aminopyridine in glycerol shows a region of high positive polarization and a region of negative polarization corresponding to the two absorption bands observed at 2900 Å and 2300 Å. Absence of any abrupt change of polarization shows that there is no other electronic transition at the long wavelength end. Presence of $n \rightarrow \pi^*$ transitions would have been detected since $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions are mutually orthogonal for these planar molecules. Possibility that it is completely superimposed by $\pi \rightarrow \pi^*$ transition is however not ruled out. The fluorescence, however, corresponds to the strong component of long wavelength absorption which doubtlessly is $\pi \rightarrow \pi^*$. As fluorescence intensity in the case of 4-aminopyridine was very low, such a study could not be carried out for this molecule.

Dept. of Chemical Technology, M. R. PADHYE.
University of Bombay, V. V. BHUJLE.
Bombay-19, *January* 22, 1969.

1. Weisstuch, A. and Testa, A. C., *J. Phys. Chem.*, 1968, **72**, 1982.
2. Hercules, D. M., *Fluorescence and Phosphorescence Analysis, Principles and Applications*, Interscience Publishers, New York, 1966, p 224.

DIMETHYL SULPHOXIDE AS A CARRIER OF COLCHICINE

INDUCTION of polyploidy through colchicine has been regarded difficult in cereal crops, presumably due to a number of successive leaves surrounding the deep-seated meristem. To overcome the slow entry of polyploidizing agents in cereals several methods have been developed, for instance, decapitating technique in sorghum and maize[4,9,10] shoot-splitting technique in rice[8] and treatment of seeds or buds with colchicine under vacuum. Besides these physical methods, chemicals such as lanolin, glycerine, etc., have also been used as medium for effective treatment.[2] The advent of dimethyl sulphoxide (DMSO) as a penetrant carrier in medicine[5,7] and biology[1,3,6] has led the authors to test the utility of DMSO as a carrier of polyploidizing agent in cereals. A preliminary experiment, carried out in barley and the results obtained are presented here.

Healthy seeds of the barley variety N.P. 104 presoaked in water for five hours were treated for 5 hours with (1) aqueous solution of

TABLE I

Treatment	Period of treatment	Percentage of germination	Growth rate (cm.)		Cytological analysis		
			Root	Shoot	No. of cells	Cells in division	Polyploid cells %
Control ..	..	43	12·8±0·102	10·7±0·103	500	37·0	..
DMSO (5%) ..	5 hrs.	38	7·3±0·110	8·7±0·113	501	40·4	..
Colchicine ..	,,	29	2·4±0·040	0·4±0·027	496	53·6	44·56
Col + DMSO 0·3% (5%) ..	,,	27	3·7±0·031	0·5±0·058	500	41·2	56·10

DMSO (5%), (2) aqueous solution of colchicine (0·3%) and (3) DMSO (5%) and colchicine (0·3%). Four replicates were taken for each of the above treatments as well as for the control.

The germination percentage in all the treatments was lower than that of the control (Table I). This was also true for the initial growth rate of root and shoot. However, within treatments the germination percentage and growth rate were higher in DMSO than those of the others. Although the percentage of germination in the combination treatment was the lowest, the growth rate of root and shoot was higher than in colchicine treatment. The anomaly was apparently due to an excess of swelling of shoot and root apices Mitotic studies on the root tip squashes showed mitotic index in all the treatments to be higher than that in the control. Interestingly the values were higher in treatments with colchicine alone than DMSO or DMSO + colchicine, probably due either to the prolonged c-metaphase or the effect of residual colchicine for a longer period in the meristem. Reduced values in combination treatments show introduction of a factor (phenomenon) interfering with persistence of c-metaphase.

The data on relative frequencies of polyploid cells in colchicine and Col + DMSO treatment (Table I) suggests that the latter treatment is more efficient. Thus, enhanced number of polyploid cells and manifestation of excess swelling suggest DMSO to be an efficient carrier of colchicine in barley.

Authors are grateful to Dr. M. S. Swaminathan, Director, Indian Agricultural Research Institute, New Delhi, for his valuable suggestions.

Nuclear Research Laboratory, Indian Agricultural Research Institute, New Delhi, *December* 30, 1968.

E. A. SIDDIQ.
(MRS.) REHANA MAJID.

1. Bhatia, C. R., *Mutation Research.* 1967, **4**, 375.
2. Blakeslee, A. F. and Avery, A. G., *J. Hered.*, 1937, **28**, 393.
3. Carter, S. B., *Nature*, Lond., 1967, **213**, 261.
4. Doggett H., *Ibid.*, 1967, **179**, 786.
5. Fabianek, J. and Herp, A., *Proc. Soc. Exptl. Biol. and Med.*, 1966, **122** (1), 290.
6. Jacob, S. W., Bischell, M. and Herschler, R. J., *Curr. Therap. Res. Clin. Expt.*, 1964, **6**, 193.
7. Kligman, A. M., *J. Amer. Med. Assoc.*, 1965, **193**.
8. Luong, D. C., *Bot. Gaz.*, 1951, **112**, 327.
9. Siddiq, E. A., *Indian J. Genet. and Pl. Breed.*, 1968, **27**(3), 442.
10. — and Swaminathan, M. S., *Curr. Sci.*, 1967, **36** (12), 307.

ON THE OCCURRENCE OF *PARACONULARIA* IN THE *FENESTELLA* SHALES OF LIDAR VALLEY, KASHMIR*

THIS note records the discovery of a conulariid, *Paraconularia* cf. *P. inæquicostata* (de Koninck),[1,2] in the *Fenestella* Shales[3-5] Series of Kashmir Valley. The collecting locality is a small quarry near the Yanar Fishing Rest House (33° 54′ : 75° 17′; 43 0/5), a little north of the famous tourist resort, Aish Muqam, in the Lidar Valley, Kashmir. Here the lower part of the Series is exposed which mainly consists of black carbonaceous shales with a few bands of limestones, and carries a rich and varied fauna[6,7] consisting of bryozoans, crinoids, trilobites, brachiopods and lamellibranchs, of which *Fenestella* is a conspicuous member, but the brachiopods are preponderant. A brief systematic description of the specimen is given below :

Family CONULARIIDAE Walcott, 1866
Subfamily PARACONULARIINAE Sinclair, 1952
Genus *Paraconularia* Sinclair, 1940
Paraconularia CF. *P. inæquicostata* (DE KONINCK) FIG. 1

The specimen is preserved as an external mould flattened on the bedding plane of a highly fossiliferous black carbonaceous shale. It shows all the morphological characters of the periderm, except the apertural portion which is broken.