We have studied this compound with Mossbauer spectroscopy in order to know the effect of replacement of one fluorine atom in $K_3[FeF_6]$ by a water molecule.

The complex $K_2[FeF_5(H_2O)]$ was prepared according to the method of Palmer[2]. *Anal.* Calcd. for $K_2[FeF_5(H_2O)]$, Fe, 22·61%. Found : Fe, 22·32%. The Mossbauer spectrometer used was a constant velocity-drive type. The source used was ^{57}Co in Cu. The Mossbauer spectrum of $K_2[FeF_5(H_2O)]$ was recorded at liquid nitrogen temperature (77° K).

The Mossbauer spectrum of $K_2[FeF_5(H_2O)]$ consists of two distinct lines as a result of quadrupole splitting. The value of the quadrupole splitting ($\Delta E_Q = 0{\cdot}60 \pm 0{\cdot}05$ mm/sec), and the isomer shift ($\delta = 0{\cdot}20 \pm 0{\cdot}05$ mm/sec) are consistent with the formulation of the complex as one containing iron(III) in the $S = 5/2$ spin state. It is interesting to note that the Mossbauer spectrum of $K_3[FeF_6]$ and $K_3[Fe(CN)_6]$ exhibit single line spectra whereas the replacement of one F or CN by H_2O leads to the appearance of quadrupole splitting due to the changes in the environment and symmetry.

Infrared spectrum of $K_2[FeF_5(H_2O)]$ was recorded in KBr pellets on a Perkin Elmer Model 521 instrument and the infrared spectrum of the compound exhibits a medium intense band at 3100 cm^{-1} due to the coordinated water[3].

The author is indebted to the UGC and the faculty research fund of the University of Bombay for support of this research.

Inorganic and Physical Chemistry Laboratory,
Dept. of Chemical Technology,
University of Bombay,
Matunga, Bombay 400019,
November 29, 1973.

A. Syamal.

1. Edwards, A. J., *J. Chem. Soc. Dalton Trans.*, 1972, p. 816.
2. Palmer, W. G., *Experimental Inorganic Chemistry*, Cambridge University Press, Cambridge, London, 1959, p. 523.
3. Van Vleck, J. H. and Cross, P. C., *J. Chem. Phys.*, 1933, 1, 357 ; Sartori, G., Furlani, C. and Damiani, A., *J. Inorg. Nucl. Chem.*, 1958, 8, 119.

A Method to Increase Protein Content in Rice

Rice (*Oryza sativa* L.) is a low protein cereal. Attempts are being made to evolve protein-rich high yielding rice through breeding so that people living mostly on rice can have a substantial increase in the total protein intake in their diets.

Das Gupta and Bera[1] explored the possiblility of increasing the efficiency of the high yielding rice varieties to utilize the nitrogen applied to the soil by the application of the trace element molybdenum and noted that the element significantly stimulated the utilization of nitrogen resulting in increased growth and yield. The protein content of the grain was also substantially increased by molybdenum[2]. Although by nitrogen fertilization alone, the protein content could be increased, a further increase could be obtained by molybdenum.

In view of the quantitative increase in the protein content in the rice grain it was considered necessary to examine how far the quality of protein is affected by molybdenum. The protein-bound amino acids in the grain (of cv. 'IR 8' grown in different combination of nitrogen and molybdenum) were therefore studied chromatographically and their concentrations in the proteins estimated colorimetrically following the techniques described by Das Choudhury *et al.*[3].

TABLE 1

Effect of nitrogen and molybdenum on protein bound amino acids (mg per g dry weight) in the grains of rice (Var. IR 8)

Amino acids	N_0		N_1		S.Em.
	M_0	M_1	M_0	M_1	
Leucine ..	6·7	8·0	11·2	13·4	± 1·5
Phenylalanine ..	2·3	3·5	3·2	3·7	± 0·3
Methionine and valine	5·5	8·5	6·3	5·8	± 0·7
γ-Amino butyric acid	—	—	—	—	—
β-Alanine ..	+	2·0	1·6	3·1	± 0·4
Alanine ..	7·5	10·0	11·0	13·3	± 1·2
Threonine ..	2·2	3·5	3·7	5·5	± 0·6
Serine and glycine ..	7·5	9·5	6·4	8·1	± 0·6
Glutamic acid ..	1·7	3·5	12·1	16·9	± 3·6
Aspartic acid ..	8·5	9·5	14·2	18·7	± 2·3
Lysine ..	4·2	4·5	4·5	6·7	± 0·6
Arginine and histidine	3·5	5·0	4·5	+	± 0·4
Proline ..	+	+	+	2·7	—
Asparagine ..	—	—	—	—	—
TOTAL ..	46·0	67·5	78·7	97·9	± 10·8

N_0 = No nitrogen, N_1 = Nitrogen applied @ 400 kg ha, M_0 = No molybdenum, M_1 = Molybdenum applied @ 40 g/ha ; + = Trace.

The data presented in Table 1 clearly show that most of the essential amino acids are present in higher concentrations in the proteins in presence of nitrogen and molybdenum. The addition of

molybdenum increases the total protein-bound amino acid content by about 2% over nitrogen. The substantial increase in the concentrations of the essential amino acids including lysine, serine and glycine, glutamic acid and others in the grain proteins suggests the great potentiality of molybdenum in the culture of protein-rich rice varieties.

University College of Agri., D. K. DAS GUPTA.
Calcutta University, P. BASUCHAUDHURI.
Calcutta-19, *February* 7, 1974.

1. Das Gupta, D. K. and Bera, G. S., *Fertil. News*, 1972, 17, 89.
2. — and Basuchaudhuri, P., *Exptl. Agric.*, 1974 (In press).
3. Das Choudhury, T. K., Lahiri, B., Bhattacharya, N. and Basu, R. N., *Indian J. Pl. Physiol.*, 1967, 10, 196.

Colchicine Induced Mixoploid in Coriander

Coriander (*Coriandrum sativum*) is one of the important condiments being used in cooking, flavouring beverages and in medicine. Increase in oil content and green foliage following polyploidy has been reported in this crop[1]. The present study was undertaken to induce polyploidy by treating seedlings at cotyledonary leaf stage with 0·15 and 0·25% of colchicine in aqueous solution for 24 hours. After treatment the seedlings were thoroughly washed with distilled water.

40 days after treatment a mixoploid plant with a few leaves which were more dark, broad and leathery in consistency was observed among the plants treated with 0·25% colchicine. The flower buds from different umbels were fixed separately in acetic alcohol (1 : 3) and PMC smears were made using 1% acetocarmine. In two umbels the chromosome number was $2n = 44$ as against $2n = 22$ in the normal ones. The mean association of chromosomes in the tetraploid cells was 2·40 IV + 1·34 III + 14·60 II + 1·20 I, the range being 1 IV + 1 III + 18 II + 1 I to 5 IV + 1 III + 10 II + 1 I per PMC at metaphase 1.

Meiotic irregularities in the form of laggards and bridges were observed during first anaphase in 20% and in 1·25% cells, respectively.

The study of the mixoploid plant is interesting in view of the low frequency of quadrivalents observed in the tetraploid cells. In an autotetraploid large number of quadrivalents is expected, since each chromosome is present in quadruplicate. But in the present study the mean frequency of quadrivalents observed in tetraploid cells was 2·40 which is rather low. The low quadrivalent frequency may be due to lack of perfect homologous partners[2]. If this is true, then it is quite likely that *Coriandrum sativum* which itself is a monotypic species may be of polyploid origin with two closely related genomes since the possibility of only quadrivalents at octoploid level has been reported in this crop[2]. Such a possibility has been recently reported in a strict diploid species like mung bean (*Vigna radiata*)[3]. Thorough investigations are required to explain the nature and causes of low quadrivalent frequency at tetraploid level. This may throw light on the phylogenetic position of this crop. Studies in this direction are under progress.

Cytogenetics Division, H. S. HANUMANTHAPPA.
University of Agril. Sci., A. SEETHARAM.
Hebbal, Bangalore 560024,
March 20, 1974.

1. Phytnikova, T. G., *Agrobiologia*, 1964, 23, 750.
2. Shiela Joshi and Raghuvanshi, S. S., *Can. J. Genet. Cytol.*, 1965, 7, 223.
3. Swindell, R. E., Watt, E. E. and Evans, G. M., *Jour. of heredity*, 1973, 64, 107.

Collar Rot of Sunflower (*H. annuus*) A New Host Record from India

Collar rot of sunflower caused by *Sclerotium rolfsii* (Sacc.) was first observed in the month of September 1972 at Oil Seed Research Station, Latur, in Maharashtra State. A review of literature shows that the fungus has not been reported so far on sunflower from India, although it has been reported on sunflower from Tucuman province[1], Argentina[2], Queensland[3] and Uruguay[4]. Affected plants in the field were recognised by sudden wilting and drying. Collar portion of the plant was the general point of attack, on which a tuft of white mycelium was found growing. Infection was mostly in seedling stage. Later on brown sclerotia were produced on the affected portion of the plant. Pathogenicity of the fungus was established by soil inoculation method. The inoculum was prepared by growing the fungus on sterilized crushed maize seed medium. Typical symptoms were produced within a week of inoculation which were identical to those produced in the field.

Division of Plant Pathology, V. V. DATAR.
Marathwada Krishi Vidyapeeth, K. J. BINDU.
Parbhani, *May* 27, 1974.

1. Inigo, R. M., *Circ. Estac. Expt. Agric. Tucuman*, 1963, 171, 3.
2. Luciano, A. and Davreux, M., *Publies. Tech. Estac. Exp'. Pergamino*, 1967, 37, 53.
3. Middleton, K. J., *Qd. Agric. J.*, 1971, 97, 597.
4. Pastorino, A., *Biol. Abstr.*, 1965, 46 (19), 86591.