BOOK REVIEWS

Food Crops for the Future: The Development of Plant Resources by Colin Tudge. (Published by Blackwell Inc, 432 Park Avenue, South Suite 1503, New York 10016, USA), 1988, pp. 225, Price: £ 9.95.

Primitive man was a hunter gatherer and was happy with his environment. He started cultivating some 10,000 years ago and exploited 150 out of 250,000 species of flowering plants and cultivated a dismal 20 species on a global scale. He started 'invading' the territories of other fellow species. Destruction of forests and associated flora and fauna on an epic scale caused serious ecological imbalance. The peer group on environment have warned that by the turn of the century we might have enough food but no fuel to cook. With this backdrop, the book by Colin Tudge is timely and apt. He is not a practising agricultural scientist. Hence, none of the chapters is dealt with in depth but the message is well-conveyed to the general elite. His candid and lucid writings are the tour de force.

There are 11 chapters and the chapter on nitrogen is disappointing but the reading of the other chapters is a treat. His knowledge of taxonomy is exemplary. Tudge wants us to believe that consumption of staple crops like cereals, potatoes, etc. is more important than the over-emphasized protein intake to meet the calorie requirements of the developing world. Potatoes and cassava are the major staple crops of Europe, America and Africa and the quality aspects are too many and genetic manipulation is not that straight forward. Hence plant breeders should keep in mind both gastronomic and agronomic features of these crops. Ergo, it is suggested high cereal yield with moderate protein content (10–12%) are the requirements of the future food crops. The author asserts "a shift toward more staple consumption than protein-rich diet is a momentous change of mind in human history".

The second most important staple plant belongs to leguminosae, consisting of 650 genera and 18000 species. Of which barely 20 species have been intensively used [*Nature* (*London*), 1981, **294**, 516]. The author has stressed the need to exploit on a wider scale two versatile species, viz. winged bean (*Psophocarpus tetragonolobus*) and bambara groundnut (*Voandzeia subterranea*). Every plant part (i.e. roots, leaves and seeds of winged bean) is a delicacy.

There is a conflict between yield and quality and they do not orchestrate together. Further, more energy is required to produce a gram of protein than of starch/sugar. A genetic engineer is not a talisman to incorporate all traits like high yield, protein content, palatability in a single variety. It is not only the quantity but quality of protein (amino acid, lysine) that concerns us and the author aptly puts it "protein content carries the yield penalty". Tudge cautions that yield increase (Biomass) is sine qua non to "feed the future population of the world and yet leave enough room for our fellow species". This is in essence conservation.

The author deserves our encomia for his assertion that new species/plants will help solve the future food problems of man-kind. Man made genus Triticale (a cross between wheat and rye) is a case in point. Efforts should continue on other genera such as *Brassica*, *Rubus* and *Raphanus* to develop promising new plants. Other unexploited crops are buck wheat, *Echinochloa turnerana*, quino and eel grass. Two tree species waiting on the wings for exploitation in deserts/semideserts are marula (*Sclerocarya caffra*) and mongongo (*Ricinodendron rautanenii*).

In tackling drought/salinity, the author has studied the minutest details of land and crop management. Mention may be made of crossing tomato (*Lycopersicon esculentum*) with salt-resistant wild type *L. cheesmanii*. Similarly salt-tolerant wheat is produced by chromosomal manipulation by utilizing genes of *Agropyron*.

The chapter on nitrogen reviews biological nitrogen fixation. The interest lies in exploring members of eubacteria which can preferentially live in the rhizosphere of millets and sorghum. Another exciting possibility is transferring 17 nitrogen fixing genes i.e. *nif* to cereals like wheat/millet. The snag lies in separating oxygen produced during photosynthesis since O_2 is lethal to these microbes. Transfer of *nif* genes to cereals and accomplishing their expression are worthwhile tasks for the future.

To avoid genetic erosion, wild plants and primitive land races are preserved in national parks and botanical gardens. Above all, germplasm should be collected, conserved and stored in gene banks. Invariably the wild species contribute genes responsible for resistance to pests, diseases and drought to improve cultivated species as in barley, rice, sugarcane, etc. Ordinarily legumes do not readily accept genes from alien sources. Some new genes were also

created by mutation by employing chemicals or irradiation with X-rays or gamma rays. Most induced mutations are recessive and mutants are mostly fatal. Further, barriers in sexual reproduction can be overcome by polyploidy, and natural polyploids are available in sugarcane, banana and cassava.

Another powerful tool is the natural or induced male sterility. This led to the production of F_1 hybrids to exploit hybrid vigour (heterosis). Great strides have been taken in the case of hybrids like sorghum, maize and sunflower, and hybrids in wheat and rice are in the offing.

The putative power of tissue culture in crop improvement has been well-detailed by the author. In general, members of Solanaceae and Umbelliferae take to tissue culture more readily than cereals and legumes. Crop improvement through tissue culture in cassava, tobacco, oil palm and coconuts is worth-mentioning. Culturing to develop elite clones of tea and cardamoms belong to a distant future. It is expected that tissue culture will provide uniform progenies but some variation do occur termed as somaclonal variations. This has been exploited to circumvent the deadly diseases of scab and viruses in potato and red rot in sugarcane. The nodal point is the sensitive dove-tailing of new crops/species/genera through tissue culture. Genetic engineering, somaclonal variation and somatic hybrids (fusion of protoplasts) are intended to achieve a quantum jump in crop yield.

In the epilogue, Tudge prophesies that 'High tech' and 'Mega projects' will fail to solve problems but created unforeseable ecological problems. However, with the available technology it is possible to tailor the future crops to feed 10 billion people by the middle of the next century.

A comprehensive list of glossary and index have increased its value and the book should find a place in every library.

GURURAJ HUNSIGI
Professor of Crop Production,
University of Agricultural Sciences,
GKVK, Bangalore 560 065.

Records of the Geological Survey of India. Vol. 113, pt. 7, 1987, pp. 133, (Published by the Geological Survey of India, Publication Division, A/3, S. J. Singh Highway, Jaipur 302 016) Price Rs. 45/-, $ 16, £ 5.20.

This book, containing a collection of seventeen miscellaneous papers by the geologists of the Geological Survey of India, Western Region, is printed in a new format with a pleasingly attractive cover. The coloured cover photograph showing the coconut-lined sea beach of Goa may, however, confuse a reader as almost all the papers deal with the geology of semi-desertic terrains of Rajasthan and Gujarat. Barring a few short communications, most of the papers included in the volume are well-documented studies on a wide range of topics. Emphasis is on field studies. Notable are the works of Ramaswamy, Sumit Kumar Ray and Samaddar. Ramaswamy, while discarding the known theories of magmatism and mateoritic impact, suggests that the Ramgarh dome of Vindhyan rocks is primarily the result of rheid flow of shale and associated subhorizontal compressions. S. K. Ray reported occurrences of albitic rocks and associated ore minerals in the Khetri region. This paper not only throws new light on the crustal history of the Delhi Fold Belt, but suggests possibilities of finding new deposits in the region. The lineament patterns of Rajasthan and Gujarat form the topic of Bakliwal and Ramaswamy's paper. Samaddar's paper gives an instructive account of ore search in the covered terrain of Bamnia—a northern extension of the Rajapura-Dariba ore-zone. Gold mineralization forms the topic of two different papers. In one, R. S. Jain gives a detailed account of occurrences of gold mineralization in Rajasthan. The other paper by Satya Prakash Mishra is indeed revealing and gives an interesting account of a very close concentration of the rock edicts of King Asoka with gold mining activities in ancient India. Hada's paper on scientific illustrations deserves attention.

The collation and organization of papers are fairly well done. However, all the papers do not seem to have been scrutinized by the editors or referees. As a result some of the papers include statements and information which sound like howlers. A few examples are: (1) "Flute casts . . . . . testify to deep seated submarine conditions" (Munshi, p.12); (ii) "The presence of a good amount of opaques and chlorite within phyllites indicates a possibility that

iorn and magnesium were contributed by the submarine volcanism" (Munshi, p. 12); (iii) "With the increase in degree of confidence, the significance in difference of means is reduced" (Bhushan, p. 30). Bhushan's paper on statistical comparison between Malani rhyolite and Jalor granite is apparently a misadventure. Most of his calculations and assumptions are based on misconceptions. These are, however, relatively minor blemishes compared to the wealth of information contained in the volume. Anyone with an interest in the geology of Rajasthan and Gujarat will be well advised to go through these papers.

A. B. Roy

Department of Geology,
University of Rajasthan,
Udaipur 313 001.

ANNOUNCEMENTS

WITHDRAWAL AND DISPOSAL OF RADIUM

All individual practitioners/medical institutions possessing radium should write to the Chairman, Atomic Energy Regulatory Board, C.S.M. Marg, Bombay 400 039 regarding the total stock of radium. The use of radium should be discontinued and all radium available with any individual/institution should be sent to Division of Radiological Protection (DRP) after getting guidance from DRP on safe packaging and transportation of the sources. Persons/institutions interested in a much safer substitute may correspond with Sales and Marketing Section, Isotope Group, Bhabha Atomic Research Centre, Bombay 400 085.

It is essential for all users of radium to give all the information to AERB and cooperate with Division of Radiological Protection to dispose of radium in the interest of overall radiation safety in their institutions.

NATIONAL SYMPOSIUM ON RAMAN SPECTROSCOPY

The National Symposium on Raman Spectroscopy organised and sponsored by the Department of Physics, Pondicherry University, Pondicherry, will be held during January 4–6, 1989 at JIPMER Campus, Pondicherry.

Raman Spectroscopy has been extensively used for studying various properties of organic, inorganic compounds, bio-physical and biochemical compounds. Hence the symposium is of great relevance and vital significance to the nation. The objective of the symposium is to expose the delegates to the recent developments of the theories and application areas of Raman Spectroscopy and create a forum of mutual exchange of ideas among the workers in this field. The symposium will cover the current and developing applications of Raman Spectroscopy, the development of equipment and instrumentation.

Further particulars may be had from Dr S. Mohan, Chairman, Organising Committee, National Symposium on Raman Spectroscopy, Department of Physics, Pondicherry University, JIPMER Campus, Pondicherry 605 006.

INDIAN ACADEMY OF SCIENCES, BANGALORE — 54TH ANNUAL MEETING

At the invitation of the Indian Association for the Cultivation of Science, Calcutta, the fifty-fourth Annual Meeting of the Academy will be held at Calcutta on Monday 31st October and Tuesday 1st November 1988.

As usual the scientific programme will include lectures by Fellows and Associates of the Academy. There will be two evening lectures and a discussion meeting.

Further details can be had from the Secretary, Indian Academy of Sciences, Post Box No. 8005, Bangalore 560 080.