million tons were produced from 23 million ha[6] (mean yield = 2608 kg/ha). Mean yield in several districts is over 3 tons. Rice productivity also increased, though not to the same extent as that of wheat.

In his present correspondence, Krishnapillai quotes Romesh Dutt, '... there has never been a single year when food supply of the country was insufficient for the people ... '. The book was published in 1950. I am not aware of the period on which his statement is based. If the pre-Green Revolution farming practices were adequate to feed the population, why were foodgrains imported in independent India from 1951 to 76? During 1965–66, 10.34 million tons of grains were imported[5]. The older generation would recall the days in the mid-1960s when wheat, rice and sugar were available only from the ration shops. Boiled, broken wheat was served, replacing rice. Shopkeepers would sell bread only when customers also purchased eggs. The Railway Catering Service would not serve normal 'thali' for dinner on 'no cereal' days imposed by the Government.

After Tiwari's pleading for 'Vedic' farming[2], Krishnapillai wants to take us further back into the era of 'food gatherers' by suggesting that the country has a long coastline bordering the Indian Ocean, which in turn is a vast resource of food. It is pertinent to state that in terms of tonnage, globally only 2% of food is obtained from aquatic sources, while 98% is produced on land[7].

Regarding transgenics, Krishnapillai, in this rejoinder, fails to provide evidence to support his earlier statement – as none exists. There are inconsistencies in the statements made, and evidence-based answers may not change his views. I reiterate sustainable increased productivity per hectare is the only option to feed the growing population, generate exportable surplus at globally competitive cost and higher income for the farmers. Reverting to agrarian traditions based on the wisdom of the past cannot feed the billion plus.

1. Bhatia, C. R., *Curr. Sci.*, 2004, **86**, 1193.
2. Tiwari, S. C., *Curr. Sci.*, 2003, **85**, 578–581.
3. Bhatia, C. R., *Curr. Sci.*, 2003, **85**, 1252–1253.
4. Krishnapillai, M., *Curr. Sci.*, 2004, **86**, 625.
5. Chopra, V. L., In *Science and Technology for Achieving Economic and Health Security* (ed. Rao, U. R.), Prism Books, Bangalore, 1995, pp. 169–188.
6. GOI, Directorate of Economics and Statistics, 1996.
7. Borlaug, N., In Proc. 5th Int. Wheat Genetics Symp., Indian Society of Genetics and Plant Breeding, New Delhi, 1978, p. 1–59.

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Turmeric and curcumin

There are certain omissions and commissions in the comprehensive review article on turmeric and curcumin by Chattopadhyay *et al.*[1]. A general article on turmeric by Khanna[2] in the same journal, mentioning a wide range of biological activities for turmeric and its constituents was not referred to. Also omitted was tumerin, a water-soluble antioxidant peptide, reported from turmeric by Srinivas *et al.*[3], which was found to be an efficient antioxidant/DNA protectant/anti-mutagen.

Curcumin is not a mixture of curcumin I, curcumin II and curcumin III, as made out in the article. Curcumin (diferuloylmethane) is the same as curcumin I. Curcumin II is desmethoxycurcumin and curcumin III is bis-desmethoxycurcumin. The structures written in the article for desmethoxycurcumin and bis-desmethoxycurcumin are in no way different from those of curcumin II and curcumin III. The structure of curcumin was elucidated as early as 1910 by Lampe *et al.*[4], as stated by Roughley and Whiting[5], which the authors cited.

By way of additional information on the clinical aspects, I wish to add that although turmeric and its constituents have been extensively studied, no clinically active commercial product has emerged in modern medicine. Central Drug Research Institute, Lucknow had tried to develop curcumin as an anti-inflammatory agent, but their efforts were not successful (N. M. Khanna, pers. commun.). The antiseptic activity of an aqueous extract of turmeric was exploited by Johnson and Johnson in Band-Aid®, a turmeric-based bandage (patents), available in the market over the last few years. P54, an oral product patented and developed by Phytopharm[6], the UK drug delivery company, consists of curcumin together with the essential oils of both *Curcuma domestica* (= *C. longa*) and *Curcuma xanthorrhiza*, suspended in a soft gelatine capsule. Phase II clinical study of P54 for inflammatory bowel disease was conducted in 2001 for possible commercial use.

1. Chattopadhyay, I., Biswas, K., Bandopadhyay, U. and Banerjee, R. K., *Curr. Sci.*, 2004, **87**, 44–53.
2. Khanna, N. M., *Curr. Sci.*, 1999, **76**, 1351–1356.
3. Srinivas, L., Shalini, V. K. and Shylaja, M., *Arch. Biochem. Biophys.*, 1992, **292**, 617–623.
4. Lampe, V., Milobedzka, J. and Kostanecki, St. V., *Berichte*, 1910, **43**, 2163.
5. Roughley, P. J. and Whiting, D. A., *J. Chem. Soc., Perkin Trans 1*, 1973, 2379–2388.
6. News item under Pharmaceuticals, *Chem. Br.*, 2001, 10.

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I observed some anomalies in the article by Chattopadhyay *et al.*[1]. As per the review, the composition of turmeric powder exceeds 100%, that is around 106%. Some structures given in the figures are repetitions. Moreover they are discussed as separate compounds. Curcumin II and demethoxy curcumin are same; Curcumin III and bis-demethoxycurcumin are same;

Sodium curminate cannot be considered a derivative, it is only the sodium salt of curcumin or curcumin in basic medium. Moreover, all the three curcumins, that is curcumin I, II and III can form the sodium salt, sodium curcuminate. The name and structure for methyl curcumin do not correspond. A compound is considered to be methyl derivative when hydrogen attached to carbon is replaced by $-CH_3$ group. Here the hydrogen of phenolic –OH groups is replaced, normally called as methoxy derivative. The expected name is dimethoxy curcumin.

1. Chattopadhyay, I., Biswas, K., Bandopadhyay, U. and Banerjee, R. K., *Curr. Sci.*, 2004, **87**, 44.

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Correction

Turmeric and curcumin: Biological actions and medicinal applications

Ishita Chattopadhyay, Kausik Biswas, Uday Bandyopadhyay and Ranjit K. Banerjee [*Curr. Sci.*, 2004, **87**, 44–53]

The corrected Figure 1 appears as below. We regret the error.

— Authors

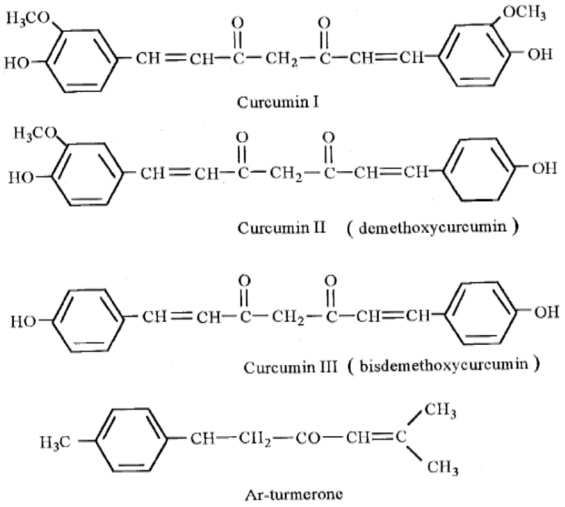

Figure 1. Structure of some natural curcuminoids.

A celebration of science*

To mark 50 years of the discovery of the triple helical structure of collagen by G. N. Ramachandran, a symposium was organized. The symposium marked the monumental discovery of the triple helical structure of collagen by Ramachandran. A galaxy of eminent scientists attended the celebration, and many of those privileged to have worked with Ramachandran shared their thoughts. The President of India, A. P. J. Abdul Kalam attended the symposium and delivered a lecture on 'Scientific and technological challenge' during a special session. Kapil Sibal, Minister of State for Science and Technology and Ocean Development and Vice President, CSIR was also present.

Samir Brahmachari, Institute of Genomics and Integrative Biology, Delhi, in his welcome address said that the symposium was essential to document the discovery made by Ramachandran (called GNR by his peers and friends) – a towering scientific personality, who stood shoulder to shoulder with Nobel laureates such as Francis Crick and Linus Pauling. Brahmachari lamented that the present generation has forgotten the success of our unsung heroes. So he hoped that the symposium would infuse the participating students and research scholars with pride at the end of the day.

The keynote address at the inaugural session was delivered by R. A. Mashelkar, CSIR. He paid tribute to the genius by stating that GNR was always at the forefront and opened new doors and windows, and so his legacy continues. He urged Indian researchers to look for points outside the lines or for zones of discomfort. He shared with the audience many reminiscences of his own research days. He detailed among others, the discoveries of the Mashelkar–Marrucci elastic boundary layer model that broke away from Prandtl's 1937 boundary layer theory, the Devotta–Mashelkar model that dealt with reptation–disengagement–diffusion dynamics for the first time and the ECTN model by Lele–Mashelkar, again a breakaway from the conventional wisdom of phenomenological constitutive equation. He ended his discussion by asking the audience to dare to learn and to learn to dare, because risks bring rewards.

V. S. Ramamurthy, DST, in his Presidential Address said that the history of science is full of path-breaking discoveries. He exhorted the present day researchers to convince themselves first, to identify and look for anomalies, to have the patience to go beyond, and to have dogged perseverance. He agreed that resource crunch

*A report on the 'Symposium on 50 years of Collagen Triple Helix: A Celebration of Science' organized by the Institute of Genomics and Integrative Biology, Delhi; Vigyan Prasar, New Delhi, and the Central Leather Research Institute, Chennai on 7 August 2004 at Vigyan Bhawan, New Delhi.