The genus Chenopodium belongs to the family Amaranthaceae, which includes former family Chenopodiaceae and contains about 165 genera and 2040 species. Amaranthaceae is a widespread cosmopolitan family and is spread from the tropics to cool temperate regions, whereas Chenopodiaceae had its centres of diversity in dry temperate and warm temperate areas. Chenopodium has a worldwide distribution and contains about 250 species; 21 species have been reported in India. The most widespread species in the Indian subcontinent is Chenopodium album L., a common weed in wheat fields in northern India, Bangladesh and Pakistan, it is popularly known as bathua in Hindi. Other reported Chenopodium weed species in India include C. ambrosioides, C. murale, C. opulifolium and C. botrys. C. album grows as a weed all over India and some names in other Indian languages include: chakvit (Konkani), vastuccira.
The classic symptoms of celiac disease are diarrhoea, gas, bloating and fatigue, and associated symptoms include low blood count (anaemia) and osteoporosis. It is more frequent among infants and children below 2 years of age, but adults also suffer and sometimes there are no obvious symptoms. Quinoa has 14–16% protein compared to 10.3–12.9% in wheat (Table 1); it has no gluten and has therefore been considered as the most healthy food grain. Quinoa has also a glycaemic index of ~53 compared to ~75 for white wheat bread and ~72 for white boiled rice. The glycaemic index is a value assigned to foods based on how slowly or how quickly they cause increase in blood glucose levels. Relatively low glycaemic index and high protein make quinoa the choice food grain for diabetics.

Peru is the leading country in the world in quinoa production. In 2014, it produced 114.3 thousand metric tonnes (TT) of the crop, followed by Bolivia (77.4 TT) and Ecuador (6.8 TT) (World Atlas.Com). Production in Peru increased from 22.3 TT in 2001 to 114.3 TT in 2014 due to high prices in European markets (11.6 US$ kg−1) as against the farm price of US$ 1.17 kg−1 in Peru. Due to increased demand in USA, Canada and Europe, cultivation of quinoa has started in several countries in the world, including India. In India, it is being cultivated in Rajasthan, Uttar Pradesh and Andhra Pradesh, but farmers are facing the problem of lack of local consumption. This is because adequate steps were not taken by the government or traders for proper procurement and export. It is not easy to enter international food grain market, because there are strict quality requirements and India is yet to have standard food quality laboratories. At least one food quality laboratory is needed in each state in the country, where farmers and traders can get their products tested for nutritional components such as proteins, including specific amino acids, carbohydrates, fibre, vitamins, minerals, etc. Most agricultural produce is sold in India on the basis of appearance, size and colour.

Quinoa is not likely to be accepted as a food grain in India, because there are a variety of food crops such as pearl millet, sorghum and several minor millets, which can meet the nutritional needs of people and can easily overcome the celiac disease problem which is generally
reported from the wheat-consuming North India. In fact, the ‘green revolution’, which in reality is the ‘wheat revolution’, has adversely affected the area under millets and sorghum. Wheat production in India has increased from 6.0 million metric tonnes (MT) in 1950–51 to 93.5 MT in 2015–16, while the area under wheat increased from 10 to 30 million hectares during the same period. Wheat is also being procured at a pre-announced price, and is procured and distributed throughout India through the Public Distribution System by the Government at subsidized prices to people living below poverty line. However, from the food and nutritional security point of view, cultivation of minor millets, pearl millet and sorghum has to be continued in their niche areas with better varieties and improved production technology. A reasonable profit to growers of these crops needs to be assured by suitable government policies. Thus, as rightly pointed out by Swaminathan and Bhavani, by mainstreaming ecological considerations in agricultural technology development and dissemination, India can enter an era of ‘evergreen revolution’ and sustainable food and nutritional security.


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CURRENT SCIENCE, VOL. 116, NO. 2, 25 JANUARY 2019 173