Chapter 10
Health Benefits and Risks of Rice

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ABSTRACT

Rice is a fundamental food in many cultural cuisines around the world, and it is an important cereal crop that feeds more than half of the world’s population. The two main categories are white rice and whole grain rice or bow ice. Whole grain rice is not processed very much, so it is high in nutritional value, whereas white rice is processed so that the bran or outer covering is removed, leaving it with less nutritional value. People choose different styles of rice for particular flavors, depending on their culinary needs, the availability, and the potential for healthy benefits as well.

INTRODUCTION

Rice is the seed of the grass species *Oryza sativa* (Asian rice) or *Oryza glaberrima* (African rice). As a cereal grain, it is the most widely consumed staple food for a large part of the world’s human population, especially in Asia. It is the agricultural commodity with the third-highest worldwide production, after sugarcane and maize, according to 2012 FAOSTAT data (FAOSTAT, 2012). After corn, rice (*Oryza sativa, L.*) is the second most widely produced cereal crop in the world, with global paddy production reaching 720 million metric tons in 2012; yet it leads all cereals in supplying caloric energy to humans, accounting for 20% of the global dietary energy intake (FAO, 2004). Rice is grown in over 100 countries and on every continent except Antarctica, extending from 50° north latitude to 40° south latitude, and from sea level to an altitude of 3000 m (Juliano, 1993; Khush, 1997; Maclean, 2002). It is also grown under an extremely wide range of air temperatures (17–33°C) (Maclean, 2002; De Datta, 1981).

Rice is a semi-aquatic annual grass plant that includes approximately 22 species of the genus *Oryza*, of which 20 are wild. Two species of rice are important for human consumption: *O. sativa* and *O. glaberrima*. *O. sativa* was first grown in Southeast Asia, somewhere in India, Myanmar, Thailand,
North Vietnam, or China, between 8000 and 15,000 years ago. *O. glaberrima* is thought to have been domesticated from its wild ancestor *Oryza barthii* by people living in the floodplains of the Niger River in Africa about 3000 years ago. Today, rice is cultivated on every continent except Antarctica. Of the two cultivated species, *O. sativa* is more widely grown, including in Asia, North and South America, the European Union, the Middle East, and Africa. Cultivation of *O. glaberrima* is confined to Africa, where it is fast being replaced by *O. sativa*.

Thousands of *O. sativa* cultivars are grown in more than 100 countries. They can be classified into three widely cultivated ecological varieties: the long-grained indica variety grown in tropical and subtropical Asia; the short/medium-grained japonica rice cultivated in temperate regions such as Japan and northern China; and the medium grained javonica rice grown in the Philippines and the mountainous areas of Madagascar and Indonesia (IRRI, 2013). Rice is cultivated in a variety of water regimes and soil types, such as saline, alkaline, and acid–Sulphur soils. Irrigated lowland systems where rice is grown in bunded fields can produce two to three crops per year, and nearly three-quarters of the world rice production. Rain-fed lowland rice is grown in bunded fields that are flooded with rainwater. The areas of greatest poverty in South Asia, parts of Southeast Asia, and essentially all of Africa use rain-fed lowland farming to produce 20% of the world’s rice. Upland rice farming done in dry land conditions produces 4% of the world’s total rice production (IRRI, 2013).

**RICE PRODUCTION**

The world dedicated 162.3 million hectares in 2012 for rice cultivation and the total production was about 738.1 million tonnes. The average world farm yield for rice was 4.5 tonnes per hectare, in 2012 (FAO, 2014). Rice is a major food staple and a mainstay for the rural population and their food security. It is mainly cultivated by small farmers in holdings of less than 1 hectare. Rice is also a wage commodity for workers in the cash crop or non-agricultural sectors. Rice is vital for the nutrition of much of the population in Asia, as well as in Latin America and the Caribbean and in Africa; it is central to the food security of over half the world population. Developing countries account for 95% of the total production, with China and India alone responsible for nearly half of the world output. (FAO, 2003).

*Figure 1. Left: O. sativa with small wind-pollinated flowers; right: O. sativa, in different growing stages*