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Golden Grain, Greater Gains: Transforming Maize Processing in Jammu

*Monica Reshi, Neeraj Gupta, Mahima, Rhythm Gupta, Kamakshi Sharma and Gyan Singh Jankawat
Division of Post Harvest Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu-180009, Jammu and Kashmir, India
*Corresponding Author's email: monikareshi@gmail.com

Maize (*Zea mays*) belongs to the grass family Poaceae and commonly known as corn, is one of those remarkable crops. It is believed to have originated in Central America**,** particularly the region of present-day Mexico. It is considered as a staple food in many parts of the world. It is a third leading crop of the world after rice and wheat (Sandhu et., al. 2007). The world production of maize was 967 million metric tons (MMT) and in India its production was 38.76 MMT in 2025-26 (India maize summit, 2026). Due to its highest yield potential among the cereals it is known globally as queen of cereals. The largest producer of maize is United States of America (USA) contributing about 35% of the total world maize production. It is known as mother grain of Americans and it is the driver of the US economy. In India, the major maize growing states are Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Punjab, Haryana, Maharashtra, Andhra Pradesh, Himachal Pradesh, West Bengal, Karnataka, and Jammu and Kashmir, jointly accounting for over 95% of the national maize production (M ilind and Isha, 2013). Beyond its conventional nutritional role as a source of carbohydrates, maize has gained considerable scientific interest owing to the presence of diverse bioactive and phytochemical constituents. These compounds include phenolic acids, flavonoids, carotenoids, anthocyanins, phytosterols, tocopherols, and other secondary metabolites, with their concentration and composition varying considerably among maize genotypes and grain fractions. Several of these phytochemicals exhibit antioxidant, anti-inflammatory, antidiabetic, hypolipidemic, and other potentially health-promoting properties. The increasing global emphasis on functional foods and nutraceuticals has consequently stimulated research into the identification, characterization, and biological evaluation of maize-derived phytochemicals. In particular, colored maize varieties, such as yellow, red, purple, and blue maize, have attracted attention because of their relatively high concentrations of carotenoids and phenolic compounds, including anthocyanins. These bioactive constituents may contribute to the prevention or mitigation of oxidative stress and other chronic metabolic disorders. Therefore, systematic investigation of the phytochemical profile, bioactive potential, and health-promoting properties of maize is essential for establishing its nutritional and functional significance and for promoting the development of innovative maize-based functional foods and nutraceutical products.

Worldwide maize is processed into a wide range of foods and beverages ranging from weaning foods and children's breakfast porridge to adult main meals and snack foods. By means of assorted processing techniques maize can also be converted into interesting value added products. Nutrition transition has been marked by a shift away from the monotonous diet pattern largely based on indigenous food crops, locally grown staples, fruits and vegetables to a highly varied diet that includes pre-processed foods. Processed foods are the commodities that have been refined or reformulated so that the finished products are more desirable to the consumers (Henderson *et al*., 2000).

Maize is a tall stout grass that produces cereal grain. The leafy stalk of the plant gives rise to male inflorescences or tassels which produce pollen, and female inflorescences called ears. The ears yield grain, known as kernels or seeds. In modern commercial varieties, these are usually yellow or white; other varieties can be of many colors. Sugar-rich varieties called sweet corn are grown for human consumption, while field corn varieties are used for animal feed, for uses such as cornmeal or masa, corn starch, corn syrup, pressing into corn oil, alcoholic beverages like bourbon whiskey, and as chemical feed stocks including ethanol and other biofuels. (Wright et., al. 2026) Maize kernel is an edible and nutritive part of the plant. The composition of maize kernel is presented in Table 1. It also contains vitamin C, vitamin E, vitamin K, vitamin B1 (thiamine), vitamin B2 (niacin), vitamin B3 (riboflavin), vitamin B5 (pantothenic acid), vitamin B6 (pyridoxine), folic acid, selenium, N-p-coumaryl tryptamine, and N-ferrulyl tryptamine. Potassium is a major nutrient present which has a good significance because an average human diet is deficient in it (Kumar and Jhariya, 2013). Roasted maize kernels are also used as coffee substitute.

Table 1. Composition per 100 g of edible portion of maize

Carbohydrate	71.88 g
Protein	8.84 g
Fat	4.57 g
Fiber	2.15 g
Ash	2.33 g
Moisture	10.23 g
Phosphorus	348 mg
Sodium	15.9 mg
Sulfur	114 mg
Riboflavin	0.10 mg
Amino Acid	1.78 mg
Minerals	1.5 g
Calcium	10 mg
Iron	2.3 mg
Potassium	286 mg
Thiamine	0.42 mg
Vitamin C	0.12 mg
Magnesium	139 mg

Maize germ contains about 45–50% of oil that is used in cooking, salads and is obtained from wet milling process. The oil contains 14% saturated fatty acids, 30% monounsaturated fatty acids, and 56% polyunsaturated fatty acids. The refined maize oil contains linoleic acid 54–60%, oleic acid 25–31%, palmitic acid 11–13%, stearic acid 2–3% and linolenic acid 1% (CRA, 2006). The two main forms of vitamin E present in our diet are alpha (α) and gamma (γ) tocopherols. Maize oil is amongst the rich sources of these tocopherols, especially γ-tocopherol and their reported concentration was 21.3 and 94.1 mg/100 g, respectively (Sen et.,al. 2006). Maize silk contains various constituents essential for our diet such as maizenic acid, fixed oils, resin, sugar, mucilage, salt, and fibers (Kumar and Jhariya, 2013). Maize (corn) is an important cereal crop used for many purposes: Food: Used to make corn flour, maize meal, porridge, tortillas, popcorn, and other food products. Animal feed: Maize grain is widely used as feed for poultry, cattle, pigs, and other livestock. Starch production: Maize is processed to produce starch used in food, textiles, paper, and pharmaceutical industries. Oil production: Maize germ contains oil that is extracted for cooking and other industrial uses. Biofuel: Maize is used to produce ethanol, an important biofuel. Industrial products: Used in the manufacture of adhesives, sweeteners, glucose, and other products. Green fodder: Maize plants are used as green fodder and silage for livestock. Popcorn: Certain maize varieties are specifically grown for making popcorn. (Chaudhary et.,al 2013)

Conclusion

Maize (*Zea mays* L.) is an important cereal crop with considerable nutritional, agricultural, industrial, and functional-food potential. In Jammu and Kashmir, maize occupies an important place in the farming system, particularly in rainfed and hilly areas, where it contributes to household food security, livestock feeding, and farm income. However, the potential of maize extends well beyond its traditional use as a staple grain or animal feed. The presence of carbohydrates, proteins, dietary fibre, minerals, essential fatty acids, tocopherols, carotenoids, phenolic compounds, flavonoids, anthocyanins, phytosterols and other bioactive constituents makes maize a promising raw material for the development of nutritious and functional value-added products.

From a post-harvest management perspective, considerable opportunities exist for reducing losses and increasing the economic value of maize through improved drying, cleaning, grading, storage, milling, fractionation, packaging and processing technologies. Proper post-harvest handling is particularly important under the agro-climatic conditions of Jammu and Kashmir, where variations in temperature and moisture can influence grain quality and storage stability. Scientific drying and safe storage can help minimize fungal contamination, insect infestation, deterioration of nutritional quality and quantitative losses.

The different fractions of maize, including germ, bran, grain, husk, cob and maize silk, can also be utilized more efficiently through a waste-to-wealth approach. Maize germ can serve as a source of edible oil and tocopherols, while bran and other fibre-rich fractions can be incorporated into bakery and extruded products. Maize silk and other underutilized fractions may provide opportunities for further research on bioactive compounds and functional ingredients. Such approaches can convert processing by-products into economically useful products rather than treating them as waste.

For Jammu and Kashmir, there is considerable scope for developing locally appropriate maize-based products such as maize flour, multigrain flour, breakfast cereals, extruded snacks, roasted maize products, bakery products, fibre-enriched cookies, ready-to-cook mixes, beverages and other functional foods. The utilization of coloured maize varieties could further facilitate the development of products rich in naturally occurring pigments and phytochemicals. Adoption of appropriate processing and packaging technologies can improve shelf life, consumer acceptability and marketability while creating additional income opportunities for farmers, women entrepreneurs, self-help groups and small-scale food-processing enterprises.

Thus, integrating maize production with scientific post-harvest management, value addition, by-product utilization and functional-food development can contribute significantly to reducing post-harvest losses and improving farm profitability in Jammu and Kashmir. Strengthening the link between farmers, food-processing units, research institutions and markets can promote a sustainable "farm-to-food" and "waste-to-wealth" approach, enabling maize to move from a conventional cereal commodity towards a diversified source of high-value nutritional, functional and industrial products.

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