

Corn (*Zea mays*) as a nutrient source and diet: A Review

Mansi Mishra, Sushma* and Reena Sharma

Department of Biosciences (University Institute of Biotechnology), Chandigarh
University, Gharuan, District-Mohali, Punjab, India

ABSTRACT

Maize is also known as corn; it is a cereal. It is a member of Poaceae family which is a grass family. Maize originated 55 to 70 million year ago in central America. By seeing phylogenetic tree of grass species related to maize, it can be conclude that there is no direct ancestor of maize. The closest ancestor of maize are teosintes. Maize contains many phytochemical-like phytosterols, carotenoids and many other phenolic compounds. Maize also helps while reliving anti-HIV activity; this takes place due to the presence of Galanthus Nivalis Agglutinin (GNA) lectin. Maize is the great source of essential fatty assets. The maize cob and the root leaves of it are used to treat problem related to bladder, Nausea, vomiting. The endosperm of maize contains an alcohol solution prolamine called Zein, Which has a great role in pharmaceutical industry. Maize also contains resistant starch which reduces cancer-cecal, atherosclerosis and obesity related issues.

Keywords: Maize; phylogenetic; prolamine; phytochemicals; potential.

INTRODUCTION

Maize is a cereal grain which belongs to family Poaceae. The word zia is a Greek word which means surviving life, and the word mays is taken from Taino language which means giving life to someone. The synonym is silk maize, makka, barajobar etc. for maize. In the entire universe, it is considered as the most principal food. After considering wheat as well as rice, it is considered as the third foremost crop of the world. It is referred as the queen of the cereals, since it has a highest production up to 967 million metric tons. USA is the highest producer of maize and contributes 35 percent of the total maize production in the world. Uttar Pradesh, Bihar, West Bengal, Haryana, Jammu and Kashmir, Andhra Pradesh, Himachal Pradesh, Rajasthan, Karnataka, these together account for about 95 percent of nations world production in India. Cornmeal, grits, starch, flour, tortillas, snacks and breakfast cereals are the forms of the animal fed which is also obtained from maize (Adiaha, 2016). Chapatis are also made out of maize in many northern state of India like Punjab and Chandigarh. Maize is majorly studied nowadays because of its nutraceuticals, the phytochemicals compounds and its health properties. Because of its nutritional and health promoting factors, maize is widely used (Brewbaker, 2003).

TAXONOMY OF MAIZE

Kingdom: Plantae

Division: Magnoliophyta

Class: Liliopsida

40 Order: Poales
41 Family: Poaceae
42 Genus: Zea

43 Species: *mays* (Tripathi et al. 2011)

44 It is an ancestor of corn. The wild relative of maize is teosintes. Its genus contains 4 species,
45 out of those 4, *Zea mays* L. is the most economically essential. Its wild species is found in
46 Mexico and Central America (Adiaha and Agba, 2016). The chromosome number of *Zea*
47 *mays* is $2n=20$. 7 genera are occupied under the tribe Andropogoneae which comprises
48 old and new world groups, these are-, Sclerachne ($2n = 20$), Trilobachne ($2n = 20$), and
49 Polytoca ($2n = 20$), Zea and Tripsacum, Coix ($2n = 10/20$), Chionachne ($2n = 20$),
50 Sclerachne ($2n = 20$), Trilobachne ($2n = 20$)

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52 **NUTRITIONAL UTILITY OF MAIZE**

53 The maize contains a kernel which is quite wholesome and edible and has a large amount of
54 nutritive content in it. The kernel contains 71.88 grams of carbohydrate, 8.84 grams of
55 protein, 04.57 grams of fat, 2.15 gram of fiber, 2.33 gram of ash, 10.23 grams of moisture,
56 348 grams of phosphorus, 15.9g of Sulfur, 114mg of Riboflavin, 1.78mg of Amino acids, 1.5g
57 of minerals, 10mg of calcium 2.3mg of iron, 286mg of Potassium, 139mg of magnesium,
58 0.14mg of copper. Since human diet comprises less of potassium, so maize has high
59 quantity of potassium in it. Coffee beans are also substituted by roasted maize kernels. The
60 oil obtained from maize germ is used in cooking food, salads, this oil is obtained with the
61 help of milling process (.Adiaha, 2016). This oil consist of up to 15 percent of saturated fatty
62 acids, 31 percent monounsaturated fatty acids-MUFA and 56 percent polyunsaturated fatty
63 acids. The refined form of the oil contains linoleic acid 56-60 percent, oelic acid-PFA 26-32
64 percent, palmitic acid 11-13 percent, stearic acid 2-3 percent and linolenic acid 1 percent.
65 The richest source of tocopherols is the maize oil. The silk maize contains the most essential
66 elements required in our diet which are-, fixed oils, resins, sugar, fibers and salts, maizenic
67 acid,mucilage

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69 **PHYTOCHEMICAL IMPORTANCE OF MAIZE**

70 Phytochemicals value of maize is that these are the chemicals which are biologically active
71 compounds, these are present in essence and congenially present in all the plants and thus
72 helps in benefiting humans (Piperno et al. 2001). Phytochemicals help in degrading the
73 danger of chronic ailment like the diseases related to the heart. Maize also contains phenolic
74 acid, carotenoids, phenolic acid, phytosterols, anthocyanins, sitosterol, stigmaterol,
75 campesterol, ferulic acid, xanthophylls, zeaxanthin.

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77 **Carotenoids**

78 Carotenoids are described as a menage of red, orange and yellow pigments. Yellow maize
79 contains the largest amount of carotenoid pigment, especially in floury endosperm. The
80 carotenoids pigments are differentiated into 2 classes- Carotenes and Xanthophylls.
81 Carotenes are considered as the hydrocarbons which is unbridled of Oxgen and Xanthophyll
82 is the pigment which in compass oxygen (Chand, 2015).

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84

85 **Phenolic Compounds**

86 The phenolic compounds are referred to as the phytochemicals present in the plant kingdom
87 which are referred as tannins, flavonoids, stilbenes, coumarins. The part of bran of maize
88 contains all the phenolic compounds. The most important and the major phenolic
89 compounds are Ferulic acid (FA) or 4 hydroxy-3-methoxycinnamic acid and anthocyanins.
90 The refined condition of corn bran contains the highest ferulic acid after which wheat and
91 barley contains its maximum amounts.

92 Anthocyanins are also a group of phenolic compound which is present as flavonoids, these
93 are the water-soluble plant pigment and are these are considered as the widest reaching
94 group of plant pigment. These have red to purple color. The quantity of anthocyanin in maize
95 is second highest, and the most important and efficient anthocyanin component found in
96 maize is cyanidin-3-(3", 6" dimalonylglucoside), peonidin-3-glucoside, pelargonidin-3-
97 (6"malonylglucoside), and cyanidin-3-glucoside, cyanidin-3-(3", 6"-malonylglucoside),and
98 cyanidin-3-glucoside.
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100 **Phytosterols**

101 These are further considered as the plant sterols which is a very indispensable component of
102 the cell wall and their membrane of plants. There are more than 250 phytosterols and those
103 are differentiated into 3 classes upon the basis of their number of methyl group C-4 position
104 holds simple sterols or 4-Desmethylsterol, 4-Monomethylsterol and 4, 4-Dimethylsterols.
105 The highest amount of phytosterols is present in maize oil. Sitosterol, stigmasterol and
106 campesterol are the most commonly consumed phytosterols. The quantity of phytosterols
107 vary I amount in the kernel of maize such as pericarp, endosperm and germ.
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110 **FOOD PROCESSING TECHNIQUES FOR MAIZE**

111 **1. Dry Milling**

112 In this process the grinding of whole grain is done to produce flour, this is the simplest
113 method which is used worldwide and is consumed shortly after processing. Crushed germ is
114 also present in the flout. Rancid odour and flavour of flour are due to the oil which is formed
115 from the broken germ cell. For the cornflakes and cereals manufacturing, which are widely
116 consumed in breakfast, large are used. In order to recover regarding the valuable if dry
117 milling germ is pressed. Grits (small as well as large) are consumed in it.
118

119 **2. Wet milling**

120 This process is used in developed countries like The USA. Ethanol and High fructose corn
121 syrup are obtained using this process of wet milling.
122

123 **3. Alkali Processing**

124 In Alkali processing, maize is prepared by cooking it with the help of lemon and water at
125 approximately 89°C for 49 minutes and then it is stirres for 15 hours before washing it with
126 pure water to remove the residual alkali and the other waste items present in maize.
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129 **PRODUCTS OF MAIZE**

130 **1. Degerminated flour**

131 It largely consists of the Endosperm and has a large amount of vitamin B. For the operation
132 of barley malt and thus helps in the production of beer. It is also used to make chapatti
133 preferably called 'makke di roti' and bread. The flour is served with green leafy vegetable
134 mustard leaves.
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137 **2. Corn germ oil**

138 This is procured by solvent extraction. A huge amount of linolenic fatty acid and the fat
139 content is 3.6 percent is found in maize oil. By refining the oil it can be served as a high
140 quality vegetable oil (David and Adams, 1985).
141

142 **3. Popcorn**

143 This is the most famous food obtained from maize. For making this corneous endosperm is
144 used. It has high popping expansion and a good flavour. Thus starch cookery is done for it.

145 When the kernels of popcorns get hot, the water vapour expands and thus the pressure
146 increases leading to the popping of kernels. This is used as a supplementary diet for
147 malnutrition children.

148

149 4. Corn Starch

150 This is obtained from the operation of wet milling of maize in which the germ and the hull of
151 maize are detached and the corn grounded and united with water. Then it is passed through
152 sieves in order to remove the semi liquid material. The protein gets suspended and the
153 starch gets settles which is washed, dried, powdered. It is inexpensive and is superior to
154 potato starch.

155

156 5. Cornflakes

157 In this, the whole grain is compressed in the huge rollers-metal rollers in order to remove the
158 bran from the outer layer, now this material obtained is mixed with salt, sugar or any other
159 seasoning and water in a large rotating pressure cooker. This cooked grain is taken to
160 conveyor belt, and then passed through drying oven, this results in soft and solid mass.
161 Then these cooked grains are allowed to cool, and tempering is done. Then these palliate
162 grains are taken to huge metal rollers under large amount of pressure and then are taken to
163 oven where a shock wave of balmy and hot air is given in order to remove remaining
164 moisture and to toast the flavour.

165

166 HEALTH BENEFITS OF MAIZE

167 B complex is contained by maize which is very well for skin, heart, brain and hair. It is also
168 good for appropriate digestion. Maize also removes the manifestation of rheumatism
169 because they ameliorate joint motility. They also improve the functioning of thyroid gland and
170 immune system because they contain vitamin A, vitamin C, and vitamin K along with
171 selenium and beta carotene (Chand, 2015). Maize contains potassium which has diuretic
172 properties. Maize is also used to treat kidney stones in many countries. It is also considered
173 useful to treat urinary tract infection, kidney stones, fluid retention and jaundice. Maize also
174 improves blood pressure levels and it supports liver functioning and produces bile. To
175 improve wounds, swellings and ulcers, it is also used. Maize silk is used for the problems of
176 bladder, nausea and vomiting and also for stomach problems.

177 Maize oil has fatty acids like linoleic acid which help in maintaining blood pressure and also
178 regulates the blood sugar level. This also helps in regulating cardiovascular maladies. In
179 order to complete the requirement of essential fatty acid, a tablespoon of maize oil is feeded.
180 Maize contains Vitamin E which prevent the dissemination of oxidative stresses in the
181 biological membrane.

182 Maize contains anti-HIV venture because of the appearance of GNA lectin in it.
183 Carbohydrates can be bound to lectin as carbohydrates receptors are present on the cell
184 membranes. The activity of virus is lectin binds to the sugar. Maize endosperm contains an
185 alcohol soluble prolamine called the Zein, which is biodegradable, non-toxic and also has
186 film establishing attributes. Since it has some nutraceutical properties and pharmaceutical,
187 so it also develops nanocomposite antimicrobial agents (Khawar et al. 2007).

188 Maize contains resistant starch also known as huge amylose maize, which has a large
189 amount of health benefiting effects. Maize encompass in total of 33.4mg per 100 grams of
190 resistant starch. Maize helps in lowering the cholesterol and thus increasing the fecal
191 excretion. It also minimizes the symptoms of diarrhea and also minimizes the danger of
192 cancer-cecal. Maize also lowers the danger of diabetes antherosclerosis and obesity.

193 Resistant starch acts as a dietary fiber which helps in weight control. It dilutes energy density
194 of the diet and also modulates certain gene expressions (Iken and Amusa, 2004).

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196 CONCLUSION

197 Maize contains various important nutrients and phytochemicals due to which it is considered
198 as the major healthy food. It has major health benefits due to which it can be considered as
199 the major diet (IITA (2001)). Its endosperm consists of 70 percent of starch. Maize oil has
200 also huge health benefits as it is the plays maximum title role in the diet of malnutrition
201 children. Zein has a very high content of leucin. Thus the level of dietary protein is great in
202 case of maize.
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