



Newly released high yielding single cross quality protein maize, popcorn and baby corn hybrids for different ecologies of India

ICAR-Indian Institute of Maize Research, Ludhiana 141 004, India

Maize (*Zea mays* L.) is one of the most important and leading cereal crop. It is a high-yielding and fast-growing crop having the highest yield potential, amongst the cereals. Recently, other than grain purpose, it is being cultivated for diverse industrial uses. There are different types of corns such as field corn, quality protein maize (QPM) popcorn, sweet corn and baby corn etc. The specialty corns which include quality protein maize (QPM), popcorn, sweet corn and baby corn etc. are rich in essential nutrients and have several health benefits. They are being popularized and cultivated worldwide due to their increasing demands and premium price making them an attractive option for the farmers.

QPM (Quality Protein Maize) is bio-fortified, non-transgenic corn that has the potentiality to provide improved protein quality to consumers. QPM consists of increased levels of lysine (>2.5%) and tryptophan (>0.6%) (Kaul *et al.* 2014). The biological value of QPM maize is double than the normal maize and comparable with milk for true protein digestibility (DMR Vision 2030). It may significantly contribute towards nutritional security and can provide solution to malnutrition in human being. QPM will also benefit the poultry, livestock, piggery and fish industries (Vasal 2000, 2001). In addition to that popcorn is an important specialty corn which is characterized by a very hard, corneous endosperm containing soft starch. The pericarp and starch packaging of the popcorn are the two

important components for its popping quality. Popcorn is commonly preferred as a snack and can be used to prepare various dishes. It has high fibre, polyphenol antioxidants and several nutrients, viz. vitamin B1, B3, B6, iron, magnesium, phosphorus, potassium, zinc, copper and manganese. Another such type of speciality corn is baby corn, which is the ear of maize plant harvested immediately after the silk emergence (1–3 cm). Baby corn is a good source of fibrous protein and easily digestible (Kawatra and Sehgal 2007). Besides proteins, vitamins and iron, it is good source of carbohydrate, thiamine and phosphorus compared to many vegetables (Source: <http://cornindia.com/babycorn/>). Baby corn has immense potential as salad and as cooked vegetable, chutney, pickles, soup and several recipes. It is used as an ingredient in ChopSuey (Chinese dish), deep fried baby corn with meat, rice and other vegetables. Baby corn is also a good option for crop diversification. It suits best to peri-urban agriculture. It offers great potential to earn foreign exchange through export of fresh/canned baby corn and its processed products.

Considering the importance of all these types of specialty corns, during 2020–21, ICAR-Indian Institute of Maize Research, Ludhiana has developed and released its six high yielding hybrids, viz. three QPM, two popcorns and one baby corn through CVRC for cultivation in different ecologies. The details of all these has been given below:

1. LQMH 1 (IMHQPM 1530)

Cultivar and growing ecologies	: Northern Hill Zone (NHZ) comprising the states of J&K, Himachal Pradesh, Uttarakhand (Hill region), Northern Eastern Hill region (Meghalaya, Sikkim, Assam, Tripura, Nagaland, Manipur, Arunachal Pradesh)
Type of Corn	: Quality Protein Maize (QPM)
Parentage	: IML 343-1 × HKI 163
Year of release (CSC on CSN & RVAC)	: 2020
Gazette Notification Details	: S.O. 3482 (E) S.N.38, 07.10.2020
Yield (Kg/ha)	: 8529
Season	: Kharif
Maturity Group	: Early (95-100 days in NHZ)
Reaction to major diseases and insects	: Tolerant to field diseases, viz. turcicum leaf blight, banded leaf and sheath blight diseases and insects <i>Sesamia inferens</i> and <i>Chilo partellus</i>



BHUPENDER KUMAR¹, S B SINGH², VISHAL SINGH¹, RAMESH KUMAR¹, SUJAY RAKSHIT¹, SUNIL NEELAM⁴, SAIN DAS⁵, M C KAMBOJ⁶, MUKESH CHOUDHARY¹, ABHIJIT DAS¹, PARDEEP KUMAR¹, K YATISH⁴, SONU KUMAR¹, PUSHPENDRA¹, D P CHAUDHARY¹, J C SEKHAR⁴, K S HOODA¹, A K SINGH¹, S L JAT¹, BRIJESH KUMAR SINGH¹ and MEENAKSHI¹

¹ICAR-Indian Institute of Maize Research, Ludhiana; ²ICAR- Regional maize research and seed production centre Kushmahout Farm, Begusarai, Bihar; ³ICAR-Indian Agricultural Research Institute, New Delhi; ⁴Maize Winter Nursery, Rajendra Nagar, Hyderabad; ⁵ICAR- Indian Institute of Maize, Pusa Campus, New Delhi; ⁶Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana.

2. IQMH 202

Cultivar and growing ecologies : North Western Plain Zone (NWPZ) comprising the states of Punjab, Haryana, Delhi, Western U.P. and Plains of Uttarakhand



Type of Corn	: Quality Protein Maize (QPM)
Parentage	: DQL 2209 × DMRQPM 106
Year of release (CSC on CSN & RVAC)	: 2021
Gazette Notification Details	: S.O. 500 (E), 29.01.2021
Yield (Kg/ha)	: 7200.0

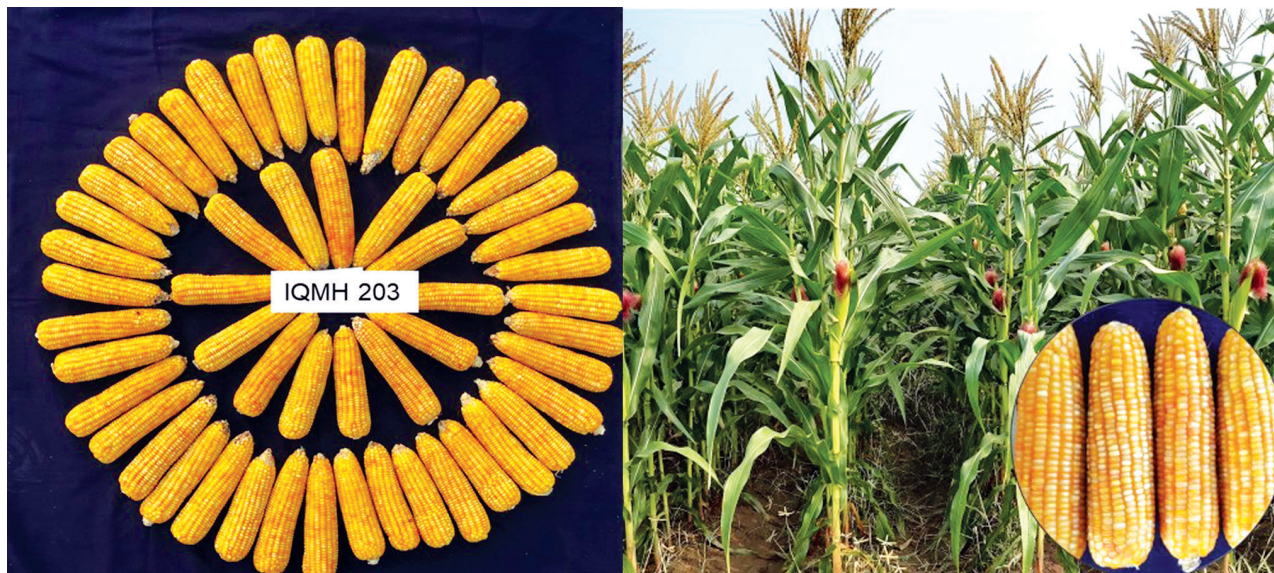
Season	: <i>Kharif</i>
Maturity Group	: Early (95 days in NWPZ)
Reaction to major diseases and insects	: Moderately tolerant to Maydis leaf blight and to <i>Chilo partellus</i>
Other Remarks	: Medium Maturity single cross hybrid. attractive yellow grain colour, high yielding, high in mean tryptophan (>0.66%) and lysine (3.04%) content, protein content ~9.0%, good tip filling, responsive to high inputs, and it can be fit in many cropping systems.

RAMESH KUMAR¹, ABHIJIT KUMAR DAS¹, S B SINGH², JYOTI KAUL³, CHIKKAPPA G K⁴, SUNIL NEELAM⁵, YASHMEET KAUR¹, SUJAY RAKSHIT¹, DHARAM PAUL¹, BHUPENDER KUMAR⁴, YATHISH K R⁵, K S HOODA¹, J C SEKHAR⁵, VISHAL SINGH¹, MUKESH CHAUDHARY¹, GANAPATI MUKRI⁴, VINAY MAHAJAN¹ and PRADEEP KUMAR¹

¹ICAR-Indian Institute of Maize Research, Ludhiana; ²ICAR- Regional maize research and seed production centre Kushmahout Farm, Begusarai, Bihar; ³ICAR-Indian Agricultural Research Institute, New Delhi; ⁴ICAR-Indian Institute of Maize Research, Office New Delhi; ⁵Maize Winter Nursery, Rajendra Nagar, Hyderabad.

3. IQMH 203

Cultivar and growing ecologies	: Central Western Zone (CWZ) comprising the states of Rajasthan, Gujarat, Madhya Pradesh and Chhattisgarh
--------------------------------	---



Type of Corn	: Quality Protein Maize (QPM)
Parentage	: DQL 2192 × DMRQPM 106
Year of release (CSC on CSN & RVAC)	: 2021
Gazette Notification Details	: S.O. 500 (E), 29.01.2021
Yield (Kg/ha)	: 6326.0
Season	: <i>Kharif</i>
Maturity Group	: Medium (89 days in CWZ)
Reaction to major diseases and insects	: Moderately tolerant to maydis leaf blight, curvularia leaf spot, RDM, fusarium stalk rot, diseases and insects <i>Chilo partellus</i>
Other Remarks	: Medium Maturity single cross hybrid. attractive yellow grain colour, high yielding, high in mean tryptophan (>0.77%) and lysine (3.48%) content, protein content >9.0%, and has good tip filling

RAMESH KUMAR¹, ABHIJIT KUMAR DAS¹, S B SINGH², SUNIL NEELAM³, CHIKKAPPA G KARJAGI⁴, YASHMEET KAUR¹, SUJAY RAKSHIT¹, BHUPENDER KUMAR⁴, VISHAL SINGH¹, YATISH K R³, MUKESH CHAUDHARY¹, PARDEEP KUMAR¹, M C DAGLA¹, BS JAT¹, DHARAM PAUL¹, KS HOODA¹, JAVAJI C SEKHAR³ and SUBY S B⁴

¹ICAR-Indian Institute of Maize Research, Ludhiana; ²ICAR-Regional maize research and seed production centre Kushmahout Farm, Begusarai, Bihar; ³Maize Winter Nursery, Rajendra Nagar, Hyderabad; ⁴ICAR-Indian Institute of Maize Research Unit office, New Delhi.

4. LPCH 3 (IMHP 1540)

Cultivar and growing ecologies	:	North East Peninsular Zone (NEPZ) comprising states of Bihar, Jharkhand, Uttar Pradesh (Eastern region), Odisha & West Bengal; Peninsular Zone (PZ) comprising states of Telangana, Andhra Pradesh, Tamilnadu, Karnataka and Maharashtra; Central Western Zone (CWZ) comprising states of Rajasthan, Madhya Pradesh, Chhattisgarh & Gujarat
--------------------------------	---	---



Type of Corn	:	Popcorn
Parentage	:	Dpcl 15-90 × Dpcl 117
Year of release (CSC on CSN & RVAC)	:	2020
Gazette Notification Details	:	S.O. 3482 (E) S.N.44, 07.10.2020
Yield (Kg/ha)	:	3500 (kg/ha)
Season	:	Kharif
Maturity Group	:	Early (80-85 days)
Reaction to major diseases and insects	:	Moderately resistant (MR) to maydis leaf blight, charcoal rot, fusarium stalk rot and curvularia leaf spot disease and fairly tolerant to <i>Chilo partellus</i>
Other Remarks	:	Early Maturity single cross hybrid. LPCH3 is high yielding short duration popcorn hybrid. It has high Popping percentage, with a mean value of 89.8 % reported in the AICRP trial. Its mean popping expansion (PE) value is 1:15, with maximum reported up to 1:20 in the AICRP testing. This hybrid is responsive to high inputs, and due to short duration it can be fit in many cropping system.

BHUPENDER KUMAR¹, S B SINGH², VISHAL SINGH¹, RAMESH KUMAR¹, SUJAY RAKSHIT¹, SUNIL NEELAM⁴, MUKESH CHOUDHARY¹, ABHIJIT DAS¹, PARDEEP KUMAR¹, K YATISH⁴, SONU KUMAR¹, JC SEKHAR⁴, KS HOODA¹, A K SINGH¹, S L JAT¹, C M PARIHAR^{1,3}, BRIJESH KUMAR SINGH¹, MEENAKSHI¹ and GARIMA CHATURVEDI¹

¹ICAR-Indian Institute of Maize Research, Ludhiana; ²ICAR-IIMR Regional maize research and seed production centre Kushmahout Farm, Begusarai, Bihar; ³ICAR-Indian Agricultural Research Institute, New Delhi; ⁴ICAR-IIMR, Maize Winter Nursery, Rajendra Nagar, Hyderabad.

5. LPCH 2 (IMHP 1535)

Cultivar and growing ecologies	:	Central Western Zone (CWZ) comprising states of Rajasthan, Madhya Pradesh, Chhattisgarh & Gujarat
--------------------------------	---	---



Type of Corn	: Popcorn
Parentage	: JP-8 × Dpcl 292
Year of release (CSC on CSN & RVAC)	: 2020
Gazette Notification Details	: S.O. 3482 (E) S.N.43, 07.10.2020
Yield (Kg/ha)	: 3095
Season	: <i>Kharif</i>
Maturity Group	: Early (80-85 days)
Reaction to major diseases and insects	: Moderately resistant (MR) to fusarium stalk rot, and curvularia leaf spots diseases
Other Remarks	: Early Maturity single cross hybrid. LPCH 2 is a high yielder with its highest Popping percentage reported up to 95% with a mean of 86.1 in AICRP trial. It has mean Popping expansion (PE) of 1: 16.6 with maximum of 1:23 reported in the AICRP testing.

BHUPENDER KUMAR¹, S B SINGH², VISHAL SINGH¹, RAMESH KUMAR¹, SUJAY RAKSHIT¹, SUNIL NEELAM⁴, MUKESH CHOUDHARY¹, ABHIJIT DAS¹, PARDEEP KUMAR¹, K YATISH⁴, SONU KUMAR¹, JC SEKHAR⁴, K S HOODA¹, A K SINGH¹, S L JAT¹, C M PARIHAR^{1,3}, BRIJESH KUMAR SINGH¹ and MEENAKSHI¹

¹ICAR-Indian Institute of Maize Research, Ludhiana; ²ICAR-IIMR Regional maize research and seed production centre Kushmahout Farm, Begusarai, Bihar; ³ICAR-Indian Agricultural Research Institute, New Delhi; ⁴ICAR-IIMR, Maize Winter Nursery, Rajendra Nagar, Hyderabad.

6. LBCH 3 (DMRHB 1305)

Cultivar and growing ecologies	: Northern Hill Zone (NHZ) comprising the states of J&K, Himachal Pradesh, Uttarakhand (Hill region), Northern Eastern Hill region (Meghalaya, Sikkim, Assam, Tripura, Nagaland, Manipur, Arunachal Pradesh)
--------------------------------	--



Type of Corn	: Baby corn
Parentage	: V 373 × HKI 1105
Year of release (CSC on CSN & RVAC)	: 2020
Gazette Notification Details	: S.O. 3482 (E) S.N.37, 07.10.2020
Yield (Kg/ha)	: 1358
Season	: <i>Kharif</i>
Maturity Group	: Early (50-55 days baby corn crop)
Reaction to major diseases and insects	: This hybrid is moderately resistant (MR) to multiple diseases, viz. turcicum leaf blight, maydis leaf blight, and banded leaf and sheath blight diseases.
Other Remarks	: Short duration (50–55 days baby corn crop), attractive colour baby corn, prolific, good yielding and responsive to inputs. Being short duration, it can be better fit in many cropping systems.

BHUPENDER KUMAR¹, S B SINGH², VISHAL SINGH¹, RAMESH KUMAR¹, SUJAY RAKSHIT¹, SUNIL NEELAM⁴, SAIN

DAS⁵, VINAY MAHAJAN⁵, M C KAMBOJ⁶, MUKESH CHOUDHARY¹, ABHIJIT DAS¹, PARDEEP KUMAR¹, K YATISH⁴, H S GUPTA⁷, G S BIST⁷, S K PANT⁷, M C PANT⁷, SONU KUMAR¹, J C SEKHAR⁴, K S HOODA⁴, A K SINGH¹, S L JAT¹, C M PARIHAR^{1,3}, BRIJESH KUMAR SINGH¹ and MEENAKSHI¹

¹ICAR-Indian Institute of Maize Research, Ludhiana; ²ICAR-IIMR Regional maize research and seed production centre Kushmahout Farm, Begusarai, Bihar; ³ICAR-Indian Agricultural Research Institute, New Delhi; ⁴ICAR-IIMR, Maize Winter Nursery, Rajendra Nagar, Hyderabad; ⁵ICAR- Indian Institute of Maize Research, Pusa Campus, New Delhi; ⁶CCS-HAU Hisar; ⁷VPKAS Almora.

REFERENCES

- <http://cornindia.com/babycorn/> accessed on 04th April, 2014.
- Kawatra A and Sehgal S. 2007. Value-added products of maize [Quality Protein Maize and Baby Corn]. National conference on "Double Maize Production" organised by IFFCO Foundation, ICAR, DMR, DAC & IFFCL at New Delhi on May 08–09, 2007.
- Kaul J, Kumar R and Chaudhary D P. 2014. Quality protein maize for food, feed and nutritional security. *Indian farming* **64**(4): 73–76. (July, 2014).
- Vasal S K. 2000. Quality protein maize story. *Food and Nutritional Bulletin* **21**: 445–50.
- Vasal S K. 2001. Keynote address, Quality protein maize development: an exciting experience Seventh eastern and southern Africa regional maize conference 11–15th Feb. CIMMYT, Apdo, Postal 6-41,00600 Mexico, D F, Mexico.