



How Purple is My Roti

Coloured wheat –purple, blue and black – is being cultivated in 700 acres across India. Scientists claim it could reduce malnourishment and possibly prevent obesity and other lifestyle diseases

Shantanu Nandan Sharma | Mohali, Punjab

How about having a breakfast of blue bread, followed by a lunch of purple chappatis? In the evening, you could say goodbye to those brown cookies and instead deliberate on what would go better with your tea: blue, black or purple biscuits?

Wheat is no longer plain old brown in India, thanks to an eight-year-long research project by a group of scientists at Mohali's National Agri-Food Biotechnology Institute (NABI). Three coloured varieties of wheat – purple, black and blue – are ready for human consumption after the Food Safety and Standards Authority of India (FSSAI) gave its nod in June last year.

Now, experiments are no longer confined to NABI's laboratory and the wheat fields on the institute's 35-acre sprawling campus. Recently, contract farming of coloured wheat, mainly the purple and black varieties, was harvested in over 700 acres across India – from Patiala and Jalandhar in Punjab to Vidisha in Madhya Pradesh. A year ago, coloured wheat was cultivated only in 80 acres, more as an experiment than as a commercial proposition.

The scientists at NABI believe that coloured wheat is the next big thing in India's agricultural landscape. The wheat gets its colour from anthocyanin. A pigment that gives colour to fruits such as blueberries and jamun, anthocyanin is an antioxidant. While having blue berries in large quantities can lead to high sugar intake, coloured wheat can give you the requisite quantities of anthocyanin without the fear of high blood sugar, say NABI scientists.

Among the new wheat varieties, the black one possesses the highest amount of anthocyanin, followed by blue and purple wheat. "We started working on it since 2011 after getting the know-how from Japan. We experimented it for several seasons before being convinced that, yes, it's adaptable to Indian environmental conditions," says Monika Garg, lead scientist on the coloured wheat project at NABI. (See interview, "Singapore has a Successful Purple Wheat Noodle Brand")

The antioxidant-rich wheat, NABI scientists claim, can reduce chances of cardiovascular diseases, diabetes and obesity. They also say that coloured wheat, which is biofortified with zinc, can fight malnutrition among children, one of the big health challenges that India faces.

"Anthocyanin is a good antioxidant that makes us healthier. It helps in the prevention of lifestyle disorders such as obesity and cardiovascular diseases. We have already experimented in

It's All About Anthocyanin

Anthocyanin, an antioxidant present in blueberries and jamun, gives colour to wheat

Proportion of Anthocyanin (ppm*)

Normal Wheat

5



Purple Wheat

40



Blue Wheat

80



Black Wheat

140



*ppm: parts per million

mice and found that those having coloured wheat had a less tendency of gaining weight," says Garg.

Ten agri-based companies have so far come forward to do business in coloured wheat even as there's ambiguity on the market for coloured wheat products (See box, "Companies Venturing into Contract Farming of Coloured Wheat"). Coloured wheat has a lower yield than normal wheat, and hence will have to be sold at a premium price. One acre gives about 20 quintals of coloured wheat at best – four quintals less than the normal variety. Among coloured wheat, the black gives the least yield – about 17-18 quintals per acre.

"The yield of coloured wheat is somewhat less than normal wheat, but it has more anthocyanin and zinc, thus making it a dose against malnutrition. The government should procure it by paying a higher MSP (minimum support price) and then introduce the products in mid-day meals," says NABI's executive director, TR Sharma, adding that he has already written to the departments concerned for its mass use.

All three varieties of wheat are now being tested by the Indian Council of Agriculture Research (ICAR) to establish their adaptability and disease resistance capabilities under various climatic conditions. Once the ICAR gives its green signal, coloured wheat could be rolled out on a pan-India level as a supplement to, if not a replacement for, the ordinary wheat that has less nutrients.

NABI, a bio-technology institute set up in

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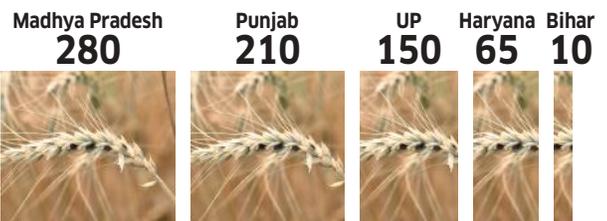
TR Sharma

executive director, NABI



Wheat Fields are Turning Colourful

Area of Cultivation in India at Present (in acres)



Source: NABI

TL;DR

- The National Agri-Food Biotechnology Institute (NABI) has applied for patents for three of its coloured wheat varieties
- It is fortified with anthocyanin, which is an antioxidant
- At least 10 companies have been given purple and black wheat seeds to venture into contract farming

“We initially cultivated black wheat in seven acres of land in Patiala. Then we moved to the purple variety. We are planning to make cookies and sell them as a premium product”

Puneet Singh Thind
farmer and director, Vegetable Growers Association of India



“We are expecting a production of 3,000-3,500 quintals. We cultivated all three varieties — purple, black and blue. The idea is to sell these at a higher price through retail chains such as Big Bazaar”

Ashutosh Sharma
CEO, Premier (India) Seed Company



Companies Venturing into Contract Farming of Coloured Wheat

Farm Grocer, Ambala
(Haryana)

Borlaug Farm Association for South Asia, Ludhiana
(Punjab)

Golden Agrigenetic India Ltd, Lucknow (Uttar Pradesh)

Premier (India) Seed Company, Vidisha (MP)

Habitat Genome Improvement Primary Producers Company, Hisar
(Haryana)

Bishwanath Agrawal (BNA), Purnea (Bihar)

Puddings & Pies, Mohali (Punjab)

Urban Platter iStore Direct Trading LLP, Mumbai
(Maharashtra)

Dayspring Foods, Porbandar (Gujarat)

Antho Grains Pvt Ltd, Mohali
(Punjab)



2010 on the outskirts of Chandigarh, comes under the Union Ministry of Science and Technology. It has already filed an application for patenting coloured wheat.

In the Lab

ET Magazine spent half a day at NABI's laboratory, interviewing four biotechnologists and researchers, including Garg. A doctorate from Tottori University, Japan, Garg, 45, began working on the project in 2011 after NABI procured exotic genome plasma from Japan and the US before getting those adapted to India's environmental conditions through plant breeding, a method of changing the genetic pattern of plants, including through crossbreeding, to increase their utility for humans. For the record, coloured wheat is not genetically modified (GM).

Garg's laboratory has state-of-the-art equipment, including an HPCL (high performance liquid chromatography) to measure anthocyanin and an ICP MS (inductively coupled plasma mass spectrometry is capable of detecting metals and several non-metals at concentrations as low as one part in 10¹⁵) to count zinc and iron. Her team includes junior scientists and pre-doctorate research scholars.

But Garg's research occasionally requires support from senior scientists in NABI's other departments. Two years ago, a team of scientists led by Mahendra Bishnoi, who specialises in diet and nutrition, divided 30 mice into five groups to see if those eating coloured wheat had less chance of becoming obese and diabetic. He found that they did not become obese like rats that were fed the same quantity of normal wheat. "Now, we are ready to test on humans, and the results are likely to be similar," says Bishnoi.

NABI has been talking to Chandigarh-based Postgraduate Institute of Medical Education and Research and other government hospitals to carry out clinical tests on humans.

Though the initial research is almost over, the bigger challenge now is in popularising it as an ingredient. Globally, countries such as China, Singapore, Australia, Austria and Canada have made some progress in rolling out coloured wheat, but no brand has become hugely popular. An exception seems to be a Singapore brand called Koka

“We wanted to find out if people having coloured wheat as staple diet would have less chance of becoming obese and diabetic. We gave raw feed to a group of mice and it worked. Now, we are ready to test on humans and the results are likely to be similar”

Mahendra Bishnoi
scientist, NABI



with its purple wheat noodles. Garg says Koka noodles are available in limited stores in Mumbai as well.

“We have so far transferred the know-how to 10 companies by signing MoUs with them. Some are growing the wheat, while others are waiting to market it. We are hoping that the final product (like bread and cookies) will be available in the market soon,” Garg adds.

This could change the staid colours and increase the nutrition quotient of chappati, parantha, naan, poori, phulka, bread, biscuits, cakes, pizza base, noodles, burgers and kulcha. However, the low productivity of coloured wheat could prove to be a stumbling block in making it a staple for the masses.

ET Magazine spoke to two entrepreneurs who are experimenting with coloured wheat. Puneet Singh Thind, director of Vegetable Growers Association of India, says he initially cultivated black wheat in seven acres in Patiala before shifting to the relatively high-yielding purple variety. “We are planning to make cookies and sell those as a premium product,” he says.

Ashutosh Sharma, CEO of Madhya Pradesh-based Premier (India) Seed Company, says he could get about 20 farmers to experiment with the new varieties after he promised them a premium of ₹500 per quintal over and above the prevailing MSP rate for normal wheat (₹1,840). The farmers cultivated all three varieties in 280 acres in Vidisha district. Sharma is now planning to sell packets of 500 grams to 3 kg at a high price through retail chains such as Big Bazaar. Premier (India) Seed Company is a small seed-selling firm with a turnover of ₹16 crore in 2018-19.

The key now lies in the right branding and smart marketing. As Koka has shown, junk funk can be sold as a health product, pleasing the most discerning and health-conscious customers. Can Indian entrepreneurs create the same magic with purple burgers? ■

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Singapore has a Successful Purple Wheat Noodle Brand

Monika Garg, NABI's lead scientist on the coloured wheat project, speaks to **Shantanu Nandan Sharma** on how some countries like China, Singapore, Austria and Australia have developed products made with coloured wheat. Edited excerpts:



What's the rationale behind growing coloured wheat in India?

Coloured wheat is normal wheat with additional anthocyanin. Anthocyanin is a good antioxidant that makes us healthier. It helps in the prevention of lifestyle disorders such as obesity and cardiovascular diseases. We have already experimented with mice and found that those having coloured wheat feed had less tendency of gaining weight. China has published some research documents on how it's helpful for diabetic population.

Can coloured wheat grab Indian market? Will it be profitable for the companies undertaking its contract farming?

We have so far transferred the know-how to 10 companies. Some of them are growing wheat, others are waiting to market the final product. In 2018-19, black and purple varieties were cultivated in about 700 acres. We are hoping that the final product (bread, cookies, etc) will be available in the market soon.

Does the productivity of coloured wheat match that of white wheat?

The productivity of coloured wheat has been about 20 quintals per acre so far. So it's somewhat less than the normal white variant (approximately 24 quintals per acre). Among the coloured varieties, the black one gives the least yield as it has higher anthocyanin and the size of the seed is also smaller. The final products made out of black wheat will have to be sold at a higher price.

Have such products succeeded globally?

Countries such as China, Singapore, Austria, Australia and Canada have marketed coloured wheat products. Singapore has a successful brand called Koka purple wheat noodle.

How has been your journey in developing coloured wheat in India?

We started working on it since 2011 after getting the know-how from Japan. We experimented it for several seasons before being convinced that, yes, it's adaptable to Indian environmental conditions. ■