

A durian feat not to be sniffed at

United by love of the thorny fruit, group cracks open its DNA and finds answers to smelly questions

Samantha Boh

Their day job was cancer research, but a group of scientists from different institutions here had another equally unifying passion.

Gathering together in Chinatown every week to get their fix during the season, the self-confessed durian connoisseurs began to ponder the complexities of the odour

and the mysterious allure of the king of fruit.

Their curiosity becoming a thorn in the flesh, they began, in their free time, to unravel the durian's DNA. Three years later, they have a complete genetic map of the fruit – a world first – and some answers to their questions.

“I was naturally curious about the durian genome – what gene causes its pungent smell? How did its

spiny husk arise?” said Professor Teh Bin Tean, deputy director (research) of the National Cancer Centre Singapore (NCCS).

Their research was done on a particular durian variety of *Durio zibethenus* – the only durian species sold commercially – called Musang King (Mao Shan Wang in Chinese). Other popular durian types like red prawn and the original D24 are all varieties of the same species.

The team found that a durian has some 46,000 genes, double that of humans. Plants are known to have more complex genomes than animals, with multiple gene repeats.

And one type of gene in particular is responsible for its notorious smell – methionine gamma lyases (MGL), which regulates odour compounds called volatile sulphur compounds (VSC) that can smell like rotten eggs or onions.

Unlike other plants which typically have just one or two MGL copies, durians have four, which means their production of VSC is “turbocharged”, and explains why they are so pungent, said study co-leader Patrick Tan, who is from Duke-NUS Medical School.

The team also traced the lineage of the durian back some 65 million years to a common ancestor with the cacao plant, whose beans are

used to make chocolate. Its closest relative is the cotton plant.

A paper on their study was published online in the prestigious journal *Nature Genetics* yesterday. The team of five hail from the Humphrey Oei Institute of Cancer Research, NCCS and Duke-NUS Medical School.

But while technology will uncover the durian's secrets, it was the love of the fruit that ultimately made it possible, the team said.

The \$500,000 project was funded by “fellow durian lovers”, who wished to be anonymous.

It was at times a rough ride.

The scientists took several bumpy drives over unpaved roads to durian plantations in Johor Baru, where they begged farmers to let them buy unripe durians for their research, said Mr Cedric Ng, senior research associate at NCCS.

Unripe fruit were needed to study how the level of MGL increases as the fruit develops.

“It is taboo to pluck unripe fruit because they think their tree will die after,” said Mr Ng.

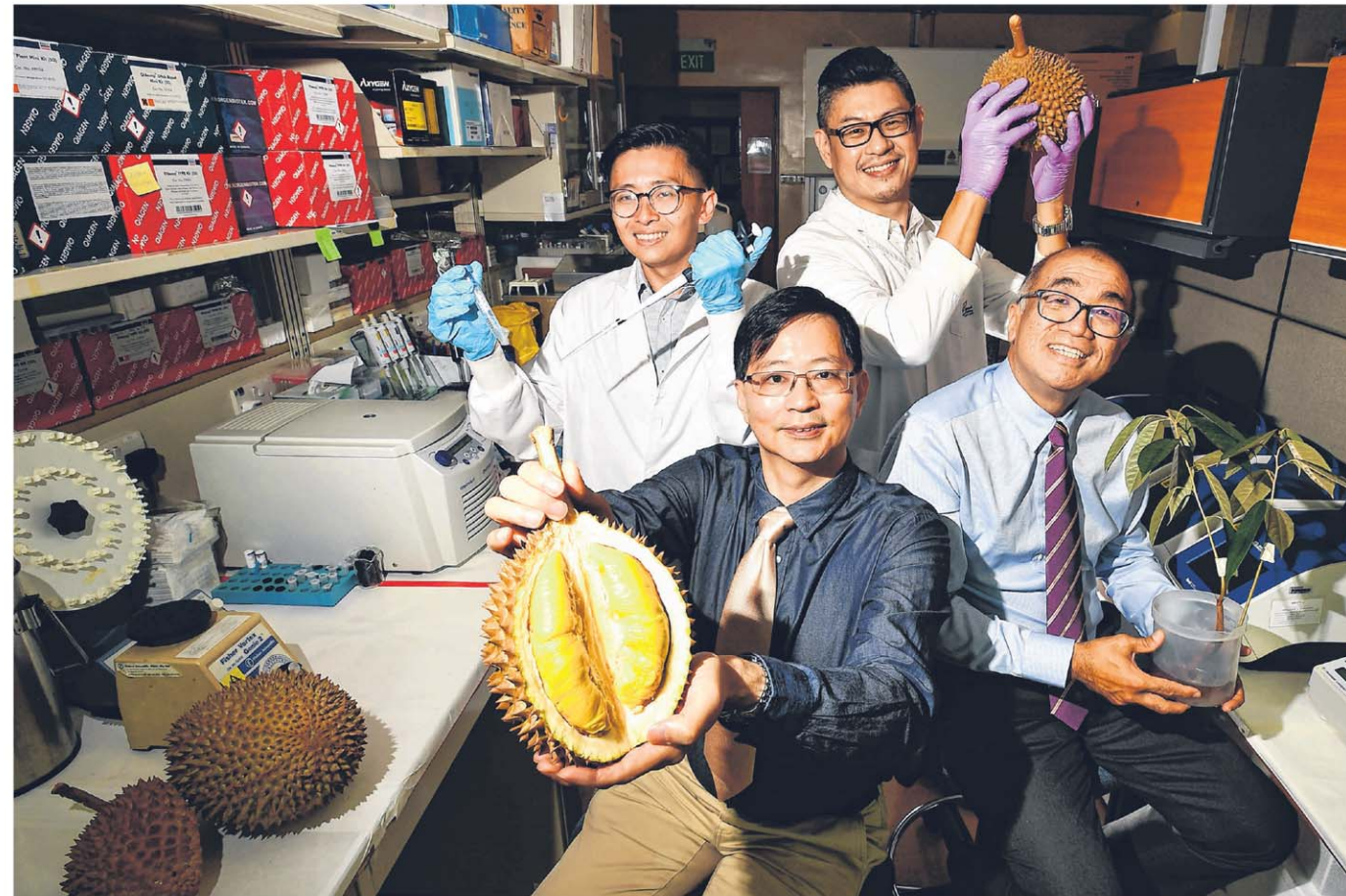
“But it has been an exhilarating journey.”

The team had to extract the DNA from the durian plant multiple times to be sequenced using advanced technology. The durian genome data has been donated to the National Parks Board.

The team hopes that its effort will pave the way for researchers to create new durian species that are drought-resistant, or low-sugar varieties suitable for diabetics, for instance.

Said Dr Nigel Taylor, group director of the Singapore Botanic Gardens: “Understanding the genome of a species can enable you to understand how to conserve it, and also its relatives.”

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(Clockwise from top left) Dr Yong Chern Han (holding a pipette and test tube), 39, research fellow, Cancer & Stem Cell Biology Programme, Duke-NUS Medical School; Mr Cedric Ng, 46, senior research associate, National Cancer Centre Singapore (NCCS); Professor Teh Bin Tean (holding a durian sapling), 52, deputy director (research), NCCS; and Professor Patrick Tan, 49, professor of Cancer & Stem Cell Biology Programme, Duke-NUS Medical School, in their lab at NCCS yesterday. ST PHOTO: LIM YAOHUI

Why durians smell and other findings

- The durian has about 46,000 genes – double that of humans, who have 23,000. Plants are known to have more complex genomes than animals.
- A class of genes called methionine gamma lyases (MGL) is behind the durian's pungent smell. These genes regulate volatile sulphur compounds, which can smell like rotten eggs.
- Plants typically have two MGL copies but durians have four, which could explain why the fruit produces more of the smelly compounds.
- The MGL level in durians grows as the fruit ripens, in tandem with the amount of volatile sulphur compounds produced.
- The genes involved in sulphur and flavour pathways in Musang King, also known as Mao Shan Wang in Chinese, are more active than in the other durian cultivars such as D24, which may explain why Musang King has the strongest taste and smell.