



हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

AgriSearch with a human touch

Marvels of Agricultural Science

Brought out on the occasion of CRRI Agriculture Education Day
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Basmati Rice – India's Pride

Basmati rice is a unique type of rice originating from the Himalayan foothills of Indian sub-continent. This rice is different from other rice types mainly due to the aroma and elongation ability during cooking. In the case of Basmati, aroma is due to the presence of a chemical called 2-acetyl-1-pyrroline, which is about 12 times more than in other types of rice. It is blessed with characteristics of extra long slender grains that elongate at least twice of their original length with a soft and fluffy texture upon cooking. Due to this, it is called "Scented Pearl". Prominent traditional Basmati rice varieties are Basmati-370, Taraori Basmati and Basmati-385. These are selections from landraces, which evolved in nature. Through systematic breeding, new high yielding Basmati varieties have been evolved. These include Pusa Basmati 1 and Pusa 1121. Scientists have overcome the problems of lodging and susceptibility to pests by introducing a new variety Pusa-1509 in the recent past. India exports this type of rice all over the world and earns about 30000 crores of rupees per year. ❄



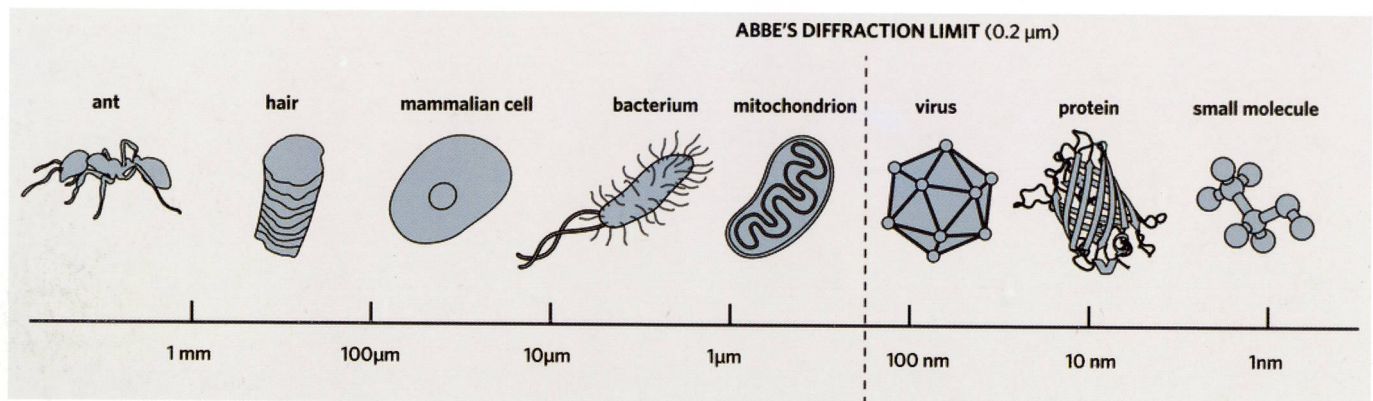
Grain and kernel size of 'Pusa 1121' in comparison with 'Sonasal', an aromatic short grain rice before and after cooking



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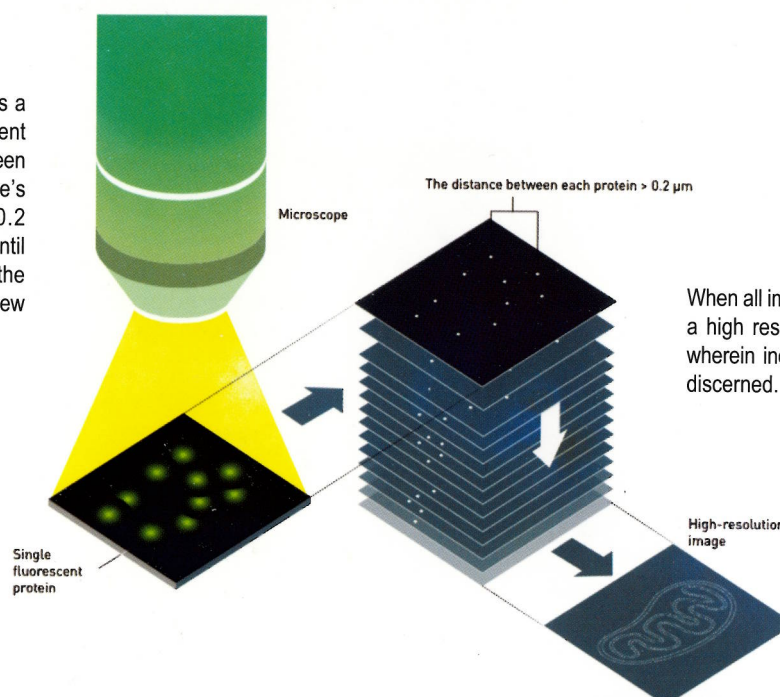
A Journey from Optical Microscope to a Nanoscope that Earned Nobel Prize

When, scientists in the 17th century for the first time studied living organisms like bacteria, yeast, fungi and red blood cells etc. under optical microscope, a new world opened up before their eyes. In 1873, the microscopist Ernst Abbe published an equation demonstrating how microscope resolution is limited by the wavelength of the light. For the greater part of the 20th century, scientists believed that they would never be able to observe things smaller than half the wavelength of light, i.e., 0.2 micrometres under optical microscope. However, during 1990s, this theory was disproved



by Eric Betzig, Stefan W. Hell and William E. Moerner, working independently. They were awarded the Nobel Prize in Chemistry 2014 for having taken optical microscopy into a new dimension using fluorescent molecules. Using the fluorescence of molecules, scientists can now monitor the interplay between individual molecules inside cells; they can observe disease-related proteins aggregate and they can track cell division at the nanolevel. Theoretically, there is no longer any structure too small to be studied. As a result, microscopy has become nanoscopy. ❄

A weak light pulse activates a fraction of all the fluorescent proteins. The distance between them is greater than Abbe's diffraction limit of 0.2 micrometres. They glow until bleached, at which point the procedure is repeated on a new subgroup of proteins



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Njavara – A Medicinal Rice

Njavara rice, a black grained traditional ayurvedic rice is found in Palakkad district of Kerala state. This rice when consumed is said to remove the ills affecting the respiratory, circulatory and digestive systems of the body. It can be used externally like in *Njavara Kizhi* (rejuvenating and nourishing treatment), which is part of Panchakarma treatment. Its cultivation is just like that of paddy. *Njavara* rice exhibits high protein, thiamine, riboflavin, niacin and fiber content as compared to the normal rice. This rice also contains higher phosphorus, potassium, magnesium, sodium and calcium levels, compared to the other varieties. In 2007, Geographical Indication (Connotes an assurance of quality and distinctiveness, which is primarily derived from a defined geographical region) status was granted for *Njavara* rice. ❄



Hydrogel for Drought Management

Hydrogel is a water absorbing material. Chemically, it is a hydrophilic (water loving) cross-linked polymer. We can imagine a cross-linked polymer like small net with lot of pore spaces. When it absorbs water, it looks like a colloidal gel. It is mainly used

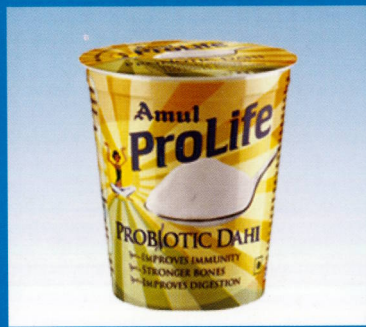
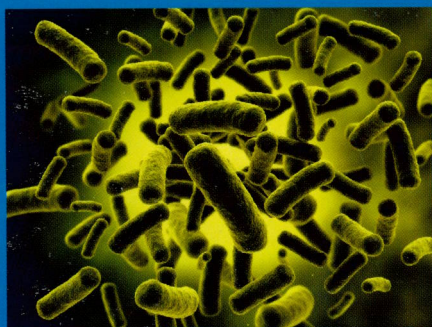
- in disposable diapers where they absorb urine, or in sanitary napkins
- as contact lenses
- in tissue engineering
- as sustained release drug delivery systems
- for encapsulation of quantum dots

As you know, our agriculture is mainly rainfed; water scarcity is a major hurdle to achieve desired yield. Hydrogel granules can hold soil moisture in water scarcity areas to improve production. These hydrogels trap moisture 400-500 times of their weight and with time, release water very slowly into the root system of plants. In addition to their role as moisture trap, hydrogel can be used as carrier for different agrochemicals, required for crop growth. ❄



Probiotic Foods for Better Health

Our markets are flooded with probiotic products like probiotic curd, probiotic lassi etc. Probiotics are “live micro-organisms which, when administered in adequate amounts, confer a health benefits on the host”. Probiotics (mostly bacteria) colonize in the gut and provide beneficial effects. Our gut also harbours more than 400 different types of beneficial bacteria. Ingestion of food materials (banana, onion, bran etc.) having non-digestible substances like dietary fibers, inulin etc. stimulates these bacteria. These food materials are named as Prebiotics. Probiotics and Prebiotics simultaneously present in a product are called Synbiotics. Such a combination aids survival of the administered probiotics and facilitates its inoculation into the colon. Probiotics, especially *Lactobacillus* sp. and *Bifidobacterium* sp. have various beneficial activities. Beneficial effects of probiotics may be on immune system, anti-cancer potential, and potential as a biotherapeutic agent in cases of antibiotic-associated diarrhoea, inflammatory and irritable bowel syndrome. One of the concerns resides in the viability, stability and reproducibility of these microbes for desired results.*



Discovery of SHELL Gene will Boost Palm Oil Production

Palm oil is commonly used as cooking oil and an important source of biodiesel. Scientists have identified a gene critical to improve the yield of palm oil, which could lead to a reduction in deforestation. Oil palm fruits consist of epicarp, mesocarp and endocarp tissues surrounding the kernel. Modern oil palm has three fruit forms, *dura* (thick shelled), *pisifera* (shell less) and *tenera* (thin shelled), which is a hybrid between *dura* and *pisifera*. The *tenera* palm yields far more oil than *dura*, and is the basis for commercial palm oil production. Scientists from the Malaysian Palm Oil Board, found the ‘SHELL’ gene, which is responsible for the fruit’s thickness, size and oil content. The ‘SHELL’ gene is an important molecular tool to improve the efficiency of the oil palm breeding programmes to develop new and improved planting materials.*



dura

tenera

pisifera

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Published by:

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