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From the Editor's

Dear Readers,

In the August issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Your suggestions are always welcome for improvement.

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## MANGO (*Mangifera indica*) SEED POWDER: A POTENTIAL SOURCE FOR WASTE WATER TREATMENT

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Three quarter of the earth is covered with water including 97% sea water and 3% fresh water. Almost two-third of fresh water is iceberg and glaciers. The available of fresh water for daily use, industry only 0.8% from the total amount of water present on earth (Dudency, 2000). Moreover, water is a vital resource for human survival and water resource increasingly becoming scarce. The need for water conservation and water management have never been more urgent. This is because our very existence as humans depends on the continued availability of this resource in good quantity and quality. At the heart of this, is the ability to utilize water and wastewater effectively. To achieve this goal, wastewater must be treated in an economic manner. In places where fresh water is in abundance, most often that not, people have to put on with the problem of heavy pollution. This makes it very expensive to treat water to meet the minimum standard required for domestic uses such as drinking and cooking and other industrial uses. Polluted water when not treated can be harmful to humans, animals and the environment.

According to WHO 3,575,000 people die from water related diseases every year. Similarly, 884 million people lack access to safe drinking water and five die annually out of the 361,000 under children, mostly in low-income countries. Dissolved and suspended particles from a major part of the impurities in most natural waters. These suspended materials mostly arise from erosion of the top soil, the dissolution of minerals and the decay of vegetation and from several domestic and industrial waste discharges. Large solids can be removed by allowing them to settle (sedimentation) and then filtered (Filtration). Suspended particles and dissolved solids and may also pass through filters.

Mango seed coat is a lignocellulosic material with

hemicellulose, cellulose and lignin as a main component. The present study was carried out to investigate activated carbon prepared from mango seed coat by varying different conditions such as activation temperatures, activating agents, impregnation volume percentage and activation hours. Characteristics such as iodine number, methylene blue number, methyl violet number, percentage yield and Brunauer-Emmett-teller surface area for various techniques were also measured to identify the quality of activated carbon produced and later compared with commercially available activated carbon.

Mango seed kernel was high in Potassium (158.0mg/100g), Magnesium (94.8mg/100g), Phosphorus (20.0mg/100g), Calcium (111.3mg/100g) and sodium (21.0mg/100g). Potassium is an essential nutrient and has an important role in the synthesis of amino acids and proteins (Malik and Srivastava, 1982). Calcium and magnesium plays a significant role in photosynthesis, carbohydrate metabolism, nucleic acids and binding agents of cell walls (Scalbert, 1991). Calcium assists in teeth development (Brody, 1994). Magnesium is essential mineral for enzyme activity like calcium and chloride; magnesium also plays a role in regulating the acid-alkaline balance in the body. Phosphorous is needed for bone growth, kidney function and cell growth. It also plays a role in maintaining the body's acid-alkaline balance (Fallon and Enig, 2001).

The valine and phenylalanine achieved higher values compared to the FAO/WHO reference (World Health Organization, 1985) followed by threonine, lysine and tyrosine which were somewhat equaled to the reference. On the other hand, arginine and glutamic acids revealed the highest values of all non-essential amino acids in mango seed kernel content. The mango seed kernel contained 15.27 (IU) vitamin A; (1.30mg/100g) vitamin E; (0.56mg/100g) vitamin K; (0.08mg/100g) vitamin B1; (0.03mg/100g) vitamin B2; (0.19mg/100g) vitamin B6; (0.12mg/100g) vitamin B12 and (0.56mg/100g) vitamin C. These results also showed that mango is richer in vitamins.

The proximate analysis show that mango seed kernel is a nutritional promising seed because of its high level of carbohydrate and oil. The results of mineral assayed showed that mango seed is very rich in calcium, potassium and magnesium. The presence of antioxidant vitamins such as vitamin C, E and A suggests that mango seed could be used as an alternative source of these vitamins. Antioxidant vitamins have been reported to reduce oxidative processes which are known to be vital in the initiation mixture which fails to form soap when blended with NaOH. The composition of unsaponifiable matter of vegetable oils including tocopherols, sterols and squalene is of great importance for oil characteristics and stability (Sim *et al.*, 1972).

The major saturated fatty acids in mango seed kernels oil were stearic and palmitic acids and the main unsaturated fatty acids are oleic and linoleic acids. The comparison of the composition in fatty acids of mango seed kernel oil with that of vegetable oils indicates that this plant is rich in acids stearic and oleic. Accordingly, mango seed kernel oil is more stable than many other vegetable oil rich in unsaturated fatty acids. Such oils seem to be suitable for blending with vegetable oils, stearin manufacturing, confectionery industry or/and in the soap industry.

One of the water treatment procedures is coagulation and flocculation process, it is one of the most widely used technique for removing suspended particles from water to make it safe and attractive for due to its simplicity and effectiveness (Choy *et al.*, 2014), it is essential process in water treatment and wastewater treatment by using chemical coagulant such as Aluminum sulphate (alum) as conventional substance. When alum is reacting with water it produces positive charged ions, while the dirt particles have negative charge ions it neutralizes the charges thus, a sedimentation is happening at the bottom so it is easy to remove. Flocculation work well together with coagulation in water treatment, after the dirt has clumped together from the coagulation process, the clumps of waste is being removed by flocculation process (Dudeney, 2000).

Many coagulations widely used in conventional water treatment to make the water is safe to be consume. The coagulant consists of several class as inorganic, synthetic organic polymer and natural polymer (Noor, M.J *et al.*, 2004). Alum is widely used, but it has been the main concern that alum may cause several bad effects on human health such as intestinal constipation, loss of memory (Alzheimer), conclusion, abdominal colic's, loss energy and learning difficulties (Fathinatural & Nityanandam, 2014). Due to health concern, there is increasing interest of a natural coagulant. Examples of natural coagulant is *Moringa oleifera*, algae, *Mangifera indica*, and *Citrus aurantifolia*. A natural coagulant is preferred is Mango (*Mangifera indica*).

Adsorption techniques for wastewater treatment have become popular in recent years due to their efficiency in the removal of pollutants. As a result of industrial activities and technological development, the amount of heavy metal ions discharged into streams and rivers by industrial and municipal wastewater have been increasing pollution. However, heavy metals such as mercury, lead, cadmium are toxic to organisms. Increased use of metals and chemicals in process has resulted in generation of large quantities of effluent that contains high level of toxic heavy metal and their presence poses environmental-disposal problems so adsorption processes are generally used. Mango seeds are a low-cost agriculture waste which could be used for adsorption of heavy metals in wastewater.



Hence to find an inexpensive and an effective absorbent to replace from aqueous effluent mango seed powder can be used as an absorbent.



Dried Mango Seed

Mango Seed Powder

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## POTENTIAL BENEFITS OF PRIYAKA : AN UNDEREXPLOITED AYURVEDIC MEDICINAL PLANT

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*Callicarpa macrophylla*, commonly known as Priyangu native to the Indian subcontinent. It belongs to the family Verbenaceae. Its fruits are small white berries that actually are drupes. The fruit is edible and can be eaten raw when it ripens. The seeds are poisonous. The leaves can also be used to make a herbal drink or as decorations. It is a useful medicinal plant for the treatment of various disorders like tumour, polydipsia, diarrhoea, dysentery, diabetes, fever, etc. In Ayurvedic system of medicine, the plant is also known as Phalawati and used for obstetric conditions.



Ayurvedic name	Priyangu, Priyaka
Unani name	Habb-ul-Mihlb
Hindi name	Dahiya
English name	Perfumed Cherry
Trade name	Dahiya & Sumali
Parts used	Leaves, fruits and roots.

**Morphological Characteristics** *Callicarpa macrophylla* – the plant The plant is an erect undershrub, 1.5–2.5 m tall. Leaves are elliptic-oblong to lanceolate or ovate to ovate-lanceolate, 12–25 × 5–11 cm, acute or acuminate at apex, acute or cuneate at base, glabrescent, crenate-dentate; densely stellate-tomentose beneath; petiole 4–12 mm long; Fruits globose, drupes or berries, white to yellowish-brown with or without fruit stalk, fresh being succulent, 1–3 mm in dia. Intact fruits are smooth and brownish in colour and exhibit centrally located bilocular carpel and 4 nutlets each embedded with a yellowish white seed, in a transversely cut surface of a fruit;

#### Floral Characteristics

Flowers appear in July–November are small, 0.5 cm long, pink in colour and crowded in axillary peduncled globose cymes, solitary, pedunculate or sessile. Flowers are bisexual, actinomorphic and fragrant. Calyx 4 or rarely 5 toothed, pubescent, corolla infundibular, 4 or rarely 5 lobed. Stamens are 4, exserted, anthers oblong 2 loculed, dorsifixed. Ovary is superior, 4 lobed, 4 loculed, 1 ovule in each locule, style short, stigma 2 lobed. Flowering & fruiting occurs during June–Dec. Fruits when tasted at first are somewhat sweet, later bitterish; fruit has fragrant odour specially after slight bruising the fruit. The fruits of *Callicarpa macrophylla* are edible.

#### Distribution

Plants of this species grow in open and secondary forests along the upper Gangetic plains, West Bengal Plains, Eastern and Western Himalayas, Kashmir, Assam, and northern Andhra Pradesh up to an altitude of 1800 meters. The species grows in other places worldwide, such as Nepal, Indonesia, China and South Korea.

### Climate and Soil

The plant grows in dry tropical forests including shaded places of ravines and scrub forests.

### Propagation Material

The planting material is seed.

### Raising Propagules

In the summer months, from June to July, seeds are sown at a rate of 5-10 kg/ha. Success of germination is about 50%. Propagation is also accomplished by stem-cuttings. The row-to-row distance should be 50 cm and plant-to-plant is 25 cm. Seeds commence germination after 30 to 45 days and stem cuttings sprout after 8-10 days.

### Land preparation

The field should be ploughed two or three times in order to have the fine tilth to facilitate planting and sprouting of stem cuttings. The FYM should be mixed with the soil at a rate of 20-25 t/ha. The NPK should be applied at 40:20:10 kg/ha as a basal dressing and the same amount as a top dressing after establishment of plant population.

### Intercropping

A crop can be raised as a sole crop for commercial purposes or in combination with other plants such as rosemary or garden sage.

### Intercultural Operations

It is done after 30-45 days and second at 60-80 days.

### Irrigation

The crop is cultivated as a rainfed crop.

### Weed Control

During the initial growth phase of the crop, weeds may hinder the crop's growth. Therefore, constant weeding and hoeing should be performed.

### Disease and Pest Control

No visible symptoms of any pest and diseases have been recorded.

### Crop Maturity and Harvesting

Crop requires about 10 months to mature. The mature fruits are plucked during second year in November-

December. Following the first year, the yield increases in the subsequent phases.

### Post-harvest Management

After plucking of fruits, these are dried in shade and kept in air tight vessels.

### Chemical Constituents

In fact, the leaf and fruit oils are both rich in selinene derivatives, with the fruit oil containing 41.6% beta-selinene and 6% alpha-selinene. Dendrolasin, another natural furanoids sesquiterpenoid, is also found in the leaf and fruit oils. The content of luteolin increased gradually with the growth of plants and reached the peak at the end of growth period. Total flavonoid accumulation of plant changed along with the growth of the plants, i.e. the contents increased gradually in the trunk and root, decreased in leaves.

Leaves contain ursolic acid, oleanolic acid; bark contains methyl betulinate and baurenol. Heart wood contains oleanolic acid and B-sitosterol.

### Yield

One hectare plantation gives yield of dried-fruits 630 kg and 1660-1680 kg of dry roots.

### Therapeutic Uses

Fruits are used in the therapeutics of burning sensation in the body, fever, vomiting, blood disorders, vertigo, nervous system and rheumatic diseases while inflorescence are used in the therapeutics of burning sensation in the body, fever, blood pitta diseases, amoebic dysentery and hyperhydrosis. The Bark is used in the treatment of rheumatism and gonorrhoea. Leaves are used for the treatment of stomach disorders In Ayurvedic literature, Priyangu is described as cooling, refrigerant, deodorant and antipyretic, tones up the digestive system, checks excessive perspiration, disinfects intestines, controls diarrhoea and allays burning sensation during fevers. Leaves are applied in rheumatic joints. Oil from root is aromatic.

## ENROLL YOURSELF TO NESA NEWSLETTER EDITORIAL BOARD MEMBER

Editorial board members of NESA newsletter will be revised for the year 2023. All the interested applicants may send their curriculum vitae to **Editor in Chief** by **16<sup>th</sup> September, 2023**.



**MEMBERS ARE REQUESTED TO PLEASE PLANT ONE TREE IN YOUR  
NEIGHBOURHOOD AND SEND US A SMALL BRIEF WITH PHOTOGRAPH OF  
THE TREE / PLANT SO WE CAN PUBLISH IN THE NESA E-NEWSLETTER**





## METHODS OF CLAY MINERAL DETERMINATION IN SOIL: AN OVERVIEW

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### Abstract:

The study of clay mineral identification is very important because it plays an important role in soil fertility and, consequently, sustainable management of soil and productivity. The size of clay minerals is very fine ( $<2\ \mu\text{m}$ ), therefore it is difficult to identify them with the naked eye. Clay minerals exhibit distinct and dynamic behavior because of their electrically charged particles. The clay minerals are present in a wide variety of rocks and soils. The behavior of clay minerals is difficult to predict; therefore, there is a need for careful consideration as they play an important role in soil fertility as well as the construction of roads, buildings, tunnels, and other infrastructure. In this popular article, we provide a brief introduction to the different methods of clay mineral identification in soil and the environment.

### 1. Introduction:

Clay minerals are naturally inorganic compounds with definite physical, chemical, and crystalline properties. Clay mineralogy appears to be one of the most important indicators of soil quality, and proper knowledge of the clay mineralogy of a soil has significant practical implications for the use of fertilizers, their application and management, and the bioavailability of heavy metals in soil. Furthermore, the soil mineralogy-soil fertility relationship is a basic component in understanding and interpreting the results of fertility experiments and soil analytical data, especially in developing fertilizer recommendation systems. Clay minerals have been extensively used in the production of building materials and ceramics due to their unique properties. Therefore, it is of great importance to identify them properly because it is of great importance to identify them properly. Several methods have been invented to identify the clay minerals, which give

information about the minerals composition and their behavior. This popular article provides brief information about the different methods of clay mineral detection in soils.

### 2. Methods of clay mineral detection in soil:

#### 2.1 X-Ray Diffraction (XRD):

X-ray diffraction method is used to identify unknown mineral phases and to determine crystal structures of soil. In this method the soil minerals are usually studied by using the powder sample, ( $<50\ \mu\text{m}$ ) or wet clay samples by laying on glass slides and, is placed in a diffractometer and irradiated with x-rays (Fig. 1).



Fig. 1 X-ray diffraction of clay sample

A plot of diffracted x-ray intensity versus twice the diffraction angle ( $2\ \theta$ ) is obtained. A simple mathematical relationship (Bragg's law) is used to relate the peaks on the x-ray chart with the distance between the diffracting planes of atoms within the crystals (Fig. 2)

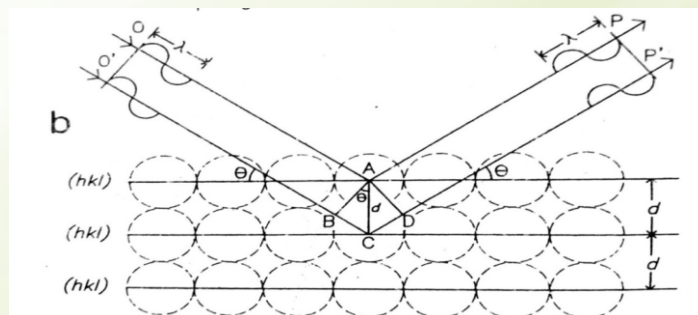


Fig. 2 Geometry of the Bragg "reflection" analogy for diffraction of x-rays by crystals (Dixon and Weed, 1989).

#### 2.2 Differential Thermal Analysis (DTA):

In this method there is simultaneous heating of a test sample and a thermally inert substance from room temperature to a little over  $100^\circ\text{C}$  and, measuring any

differences in temperature between the sample and the inert substance by means of a differential thermocouple. The analytical results are portrayed as a curve, called thermograph, in which the abscissa is the sample temperature and the ordinate is the difference in temperature between the sample under test and thermally inert reference. DTA Curve may be endothermic

(downward plot) or exothermic (upward plot). In exothermic reaction, the sample temperature is higher than that of the reference, whereas in endothermic reactions the sample temperature is less than that of the reference material and if there is no reaction happening in the sample material then the sample temperature remains the same as that of the reference material.

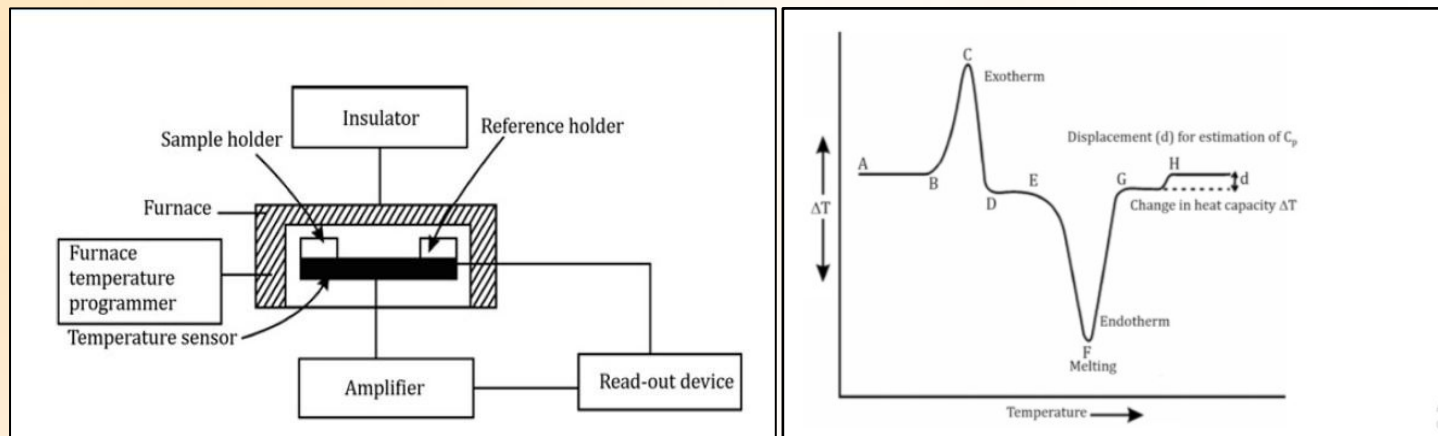
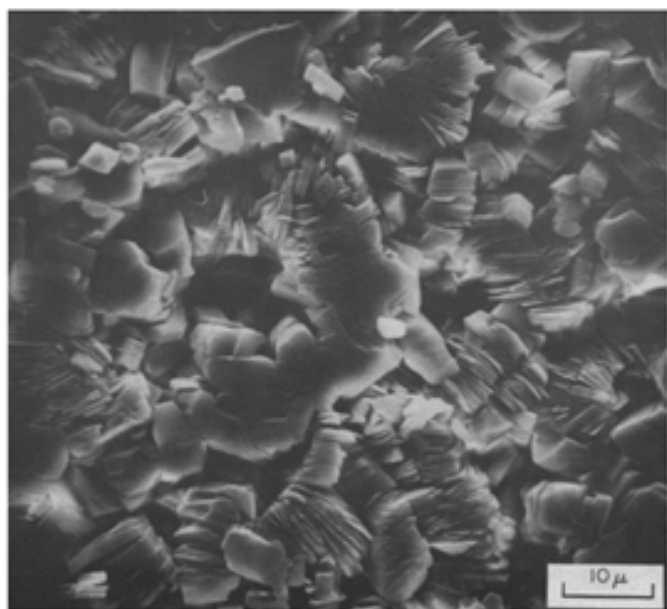


Fig. 3: Schematic representation of component and characteristics of DTA (Akash and Rehman, 2020).

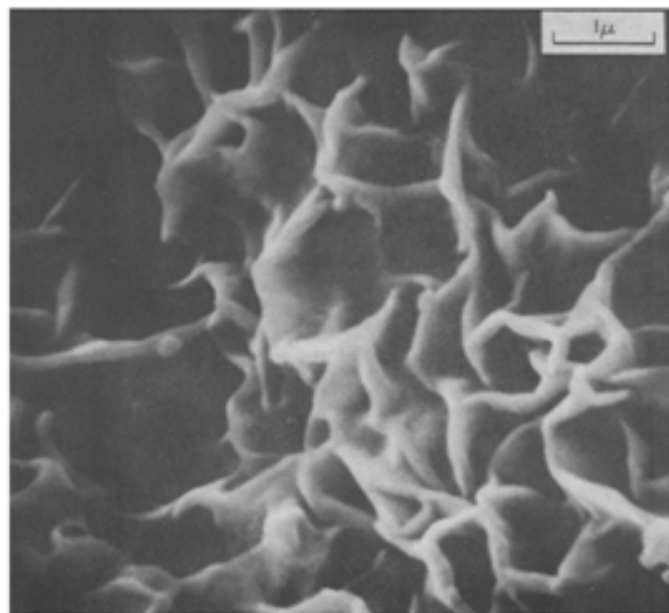
**2.3 Scanning Electron Microscopy (SEM):**

The scanning electron microscope is exclusively suited for detection of clay minerals as it affords a magnified, three dimensional view of natural clay surface with great depth of focus. The feature of the clays and clay minerals

observed on the SEM includes morphology, fabric, texture, and growth mechanics of crystals and crystallites. The following figure shows that the highly magnified view of kaolinite and Wyoming bentonite.



(a)



(b)

Fig. 4 : View of clay minerals in SEM a) Kaolinite b) Wyoming bentonite (Source: Bohor and Hughes, 1971).

**2.4 Transmission Electron Microscope (TEM):**

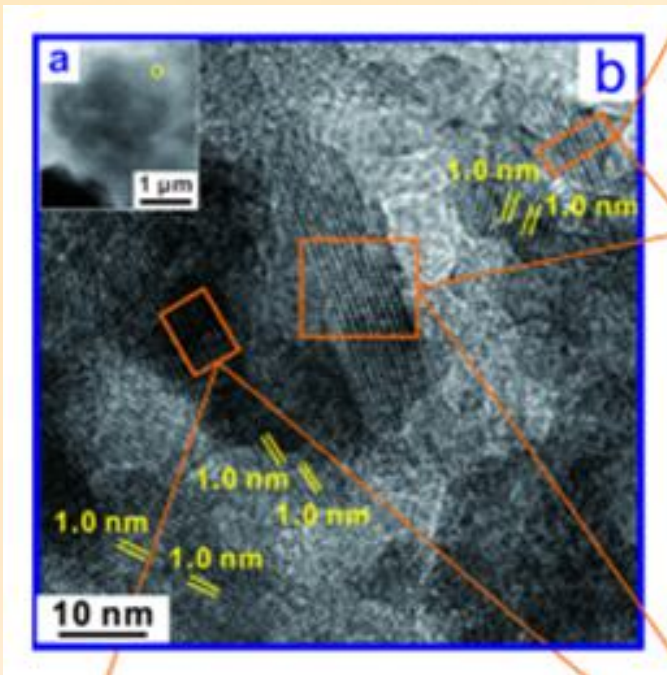
TEM is a powerful technique for clay mineral analysis and has been widely used for more than half a century. TEM enables direct observation of the micromorphology and microstructure of clay minerals. In particular high resolution TEM with a X-ray diffraction (XRD) spectrometer can provide abundant information on unique

microstructural characteristics of clay minerals such as interstratification, mixed layer structures atomic arrangements and crystal defects.

**2.5 Infrared Spectroscopy (IR):**

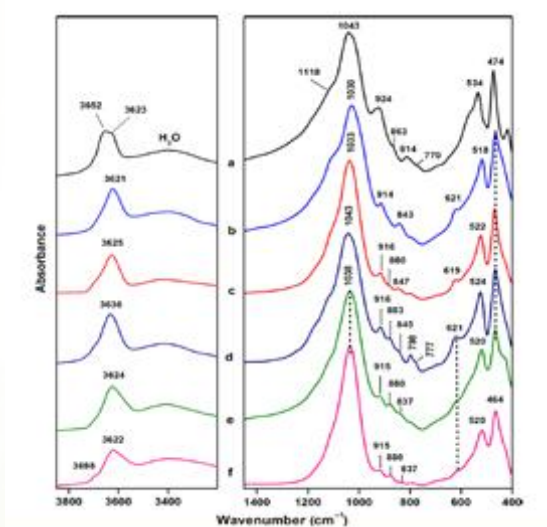
An infrared spectrum can serve as a fingerprint for mineral identification and can also provide information about the



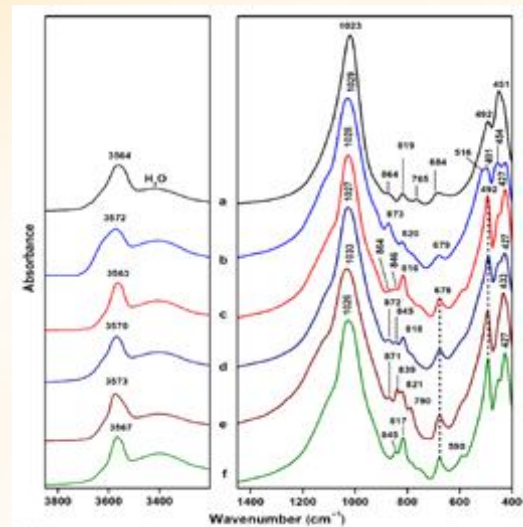


**Fig. 5 : TEM image of an ultrathin section of shale sample (Source: Liu et al., 2019).**

mineral structure, type of clay minerals, the nature of isomorphous substitution and the presence of both crystalline and noncrystalline impurities. Infrared spectroscopy deals with a longer wavelength. It is commonly divided into three parts i) near IR (780 nm to 1.4 μm) (ii) mid IR (1.4 μm to 3 μm) and, iii) far IR (3 μm to 1mm). The bands present in the NIR spectra of clay minerals are related to overtones of fundamental stretching vibrations of the structural OH groups. The absorption bands present in the MIR spectra of clay minerals can be related to the fundamental stretching and bending vibrations of their basic functional groups i.e. OH and Si-O groups. The position of the individual vibrational bands of OH and Si-O groups significantly depend on the structural characteristics and chemical composition of the clay minerals under study.



(a)



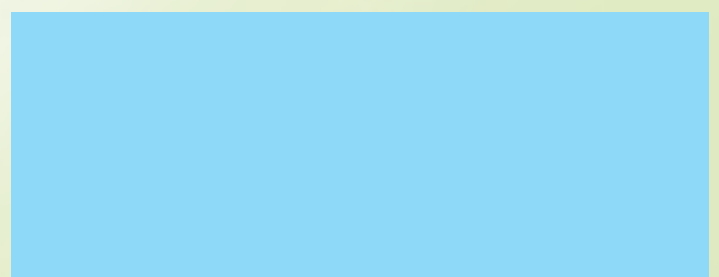
(b)

**Summary:**

This article has discussed the different methods of clay mineral identification. A powder sample of rock or soil can be used to identify clay minerals under different methods. X-ray diffraction (XRD) is the most commonly used method for clay mineral identification. Infrared Spectroscopy (IR) is the fastest method of clay mineral detection and can save energy, time, and money.

**Reference:**

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## WORLD OCEAN DAY-2023 “PLANET OCEAN: TIDES ARE CHANGING”

Date & Time: 8th June, 02:30 pm-5:30 pm

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### Introduction to the theme by Prof. Tanu Jindal

**Prof. (Dr.) Tanu Jindal**, Director of Amity Institute of Environmental Toxicology, Safety, and Management (AIETSM), Amity University, Noida (India).

- She welcomed the dignitaries and introduced this year's theme for World Ocean Day, Planet Ocean: Tides are Changing. She gave a welcoming speech highlighting the theme. She talked about Amity Science Technology and Innovation Foundation. The focus of the foundation is to provide a multi-dimensional thrust on research & development. Earth environment & climate cluster is a very important cluster for global warming and climate change. She discussed various programs associated with different institutes. She highlighted her projects, patents and books. She discussed the Amity Institute of Oceanography & Atmospheric Sciences (AIOAS). Amity Institute of Environmental Toxicology, Safety and Management (AIETSM) had participated in the 10<sup>th</sup> Indian Southern Ocean Expedition (SOE). She discussed different instruments which were used in the sampling of ocean water like CTD, UCTD, MPN, Micro profiler, FRRE, etc. She showed the laboratory setup on the Ship. She focused on the results of the different water samples which were collected during the 10<sup>th</sup> SOE. High reliance on plastics since 1950 and increased global production of plastic by 9 %. Sources of marine litter, the environmental and source economic impacts, human behavior and cultural drives, and tools to assess innovative sector-relevant solutions. Lack of affordable and sustainable alternatives available to consumers, shift away from single-use plastic products, and technology for recycling and reusing litter. Save Ocean and Save Life was the punch line.

Address by **Dr. Ashutosh Srivastava**, Centre Head, Centre of Marine Science and Technology, Amity Institute of Biotechnology

- An inspirational message was addressed by **Dr. Ashutosh Srivastava**, Center Head of the Centre of Marine Science and Technology, Amity Institute of Biotechnology, Amity University, Noida. He thanked Prof. Tanu Jindal for the invitation. He addressed the theme for World Ocean Day, Planet Ocean: Tides are Changing.

Address by **Dr. D.K. Bandyopadhyay**, Chief Advisor FPO, Chairman, Amity Law School

- An inspirational message was addressed by **Dr. D.K. Bandyopadhyay**, Chief Advisor FPO, and Chairman, Amity Law School, Amity University, Noida. He welcomed the dignitaries and addressed this year's theme for World Ocean Day, Planet Ocean: Tides are Changing. The temperature of the polar regions is increasing. He appreciated AIETSM Team for organizing this event. He thanked Prof. Tanu Jindal for the invitation.

Presentations were given by-

1. **Dr. Satheesh C. Shenoi**, Former Director, Indian National Centre for Ocean Information Services (INCOIS)- “Climate Change and Oceans”

He gave a brief introduction to global surface temperature. He discussed the change in global surface temperature from 1850 to 2020. In 2020, the global sea level set a new record and the rate of sea level rise is accelerating. It doubled from 1.4 mm/year to 3.6 mm/year during 2006-2015. Between 1979 and 2021, the Antarctic ice sheet lost 114 Gt of ice per year, contributing 13.7 mm to sea level rise. Altimeter data during 1993-2012 shows that the rate of sea level rises over the North Indian Ocean is similar to the Global value of 3.2 mm yr<sup>-1</sup>. More than 500 sites have been inventories with low O<sub>2</sub> conditions in the past half century; in the open ocean O<sub>2</sub> waters encompass several million km<sup>3</sup>. India has 30,000 plastic processing units, and over seven thousand recycling units. The present annual per capita consumption of plastics is 13.6 kg per year and is estimated to increase to 24 kg per year by 2025. The Ganges-Brahmaputra ranked the sixth-highest plastic waste contributor to the Indian Ocean. Smaller polluted Indian rivers are also major contributors of plastic to the ocean. The frequency of extremely severe cyclonic storms has increased during the post-monsoon seasons of 1998-2018. The Paris Agreement set out a global framework to avoid dangerous climate change by limiting global warming to well below 2° C and pursuing efforts to limit it to 1.5 °C. The world needs rapid decarbonization to limit the temperature rise to 1.5-2.0°C above pre-industrial levels to avoid triggering multiple irrevocable changes in the climate system.

2. **Prof. Sunil Kumar Singh**, Director National Institute of Oceanography (NIO) - “Indian Ocean: Global Perspective”

- He discussed the origin of the earth, ocean, and atmosphere. Volcanic outgassing creates an atmosphere (CO<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub>O). The chemical





weathering process removes atmospheric CO<sub>2</sub>. Volcanism is the major source of atmospheric CO<sub>2</sub>. Silicate weathering acts as the major sink for atmospheric CO<sub>2</sub>. He discussed ocean chemistry and more iron in the ocean. Indian monsoons, extreme events, biogeochemistry, and physical changes in IO are the major sources for climate change. The oceans have absorbed ~ 93 % of the additional heat due to anthropogenic global warming since 1950.

**3 Dr. Anil Kumar N.,** Scientist G, National Centre for Polar and Ocean Research (NCPOR) “Understanding the Southern Ocean Ecosystem processes in the global warming scenario: an overview of Indian campaign”

- He discussed various campaigns for the Southern Ocean. He also discussed the Antarctic circumpolar current. He and his team had participated in the 11<sup>th</sup> Indian Scientific Expedition to the Southern Ocean. The journey started from Mauritius to the Southern Ocean and the Southern Ocean to Mauritius. Gyres are subject to large-scale cyclonic wind stress, leading to strong easterly winds over the shelf break that depresses isotherms. They are planning to set up mooring systems in the Indian Sector of the Southern Ocean in collaboration with Southern Ocean Observing System (SOOS). Surface flux mooring in the subtropical frontal region of the Southern Ocean. Time series measurement is to collect the hydrodynamic and biochemical observations for a period of one year covering all seasons. They are working on the presence of microplastics in the Antarctic organisms.

**4. Dr. Narsinh Thakur,** Senior Principal Scientist, National Institute of Oceanography.

#### “Marine Bioprospecting”

- He talked about marine bioprospecting, marine organisms, and chemical ecology. Bioprospecting means a systematic and organized search for useful products derived from bioresources including plants, microorganisms, animals, etc. that can be developed further for commercialization and overall benefits of the society. Marine organisms are the potential organisms for drug discovery. Sea anemones, coral, algae, jellyfish, and barnacles are the potential organisms for bioprospecting. In some sponge species, 40 % of the animal's biomass is attributed to bacteria, which exceeds the bacterial population of seawater by two to four orders of magnitude. Some sessile organisms like sponges provide habitat space for microorganisms. Ayurveda, the ancient Indian medical system recommends marine products such as praval (coral), mukta (pearl), kapardika (cowry), shukti (oyster shell), shankha (conch), agnijara (amber), etc. In many surgeries, marine sponges are used and approximately 5 different marine natural products are currently on the market. Plitidepsin is used as an anti-cancer. The unique marine environment facilitates the biosynthesis of an array of secondary metabolites which act as chemical weapons of marine organisms.
- 5. Captain Sarabjeet Singh Parmar,** Senior Fellow, National Maritime Foundation.

“Balancing the Oceans and Humanity”

➤ He discussed about the balancing of oceans and humanity. He also discussed acidification, sea level rise, and plastic pollution. The sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of the ocean ecosystem. All economic activities related to oceans, seas, and coasts. The center for the blue economy is now a widely used term around the world with three related but distinct meanings. National prosperity, increase employment, promote entrepreneurship, climate change mitigation, and sustainable development are the advantages. It is required to change the tide. Need to breathe, think, and dream balancing oceans and humans needs while progressing blue economy.

6. **Dr. PV Bhaskar.** Scientist E, Ocean Science Group, National Centre for Polar and Ocean Research (NCPOR)

“Changing times: Impact on diversity and food web in the Arctic”

➤ He discussed atmospheric/ocean drivers which take part in the change in Southern Ocean habitats. The Arctic region warming up 3 times than the global average. Glaciers along Kongsfjorden shrinking rate  $150 \text{ m yr}^{-1}$  (Svendsen et al. 2002). He showed the aerial view of Knogsfjord of the year 2011 and 2018. Phytoplankton depends on temp, light, and nutrients. Composition of phytoplankton affects grazing community: diatoms-based food-web to microbial loop. He discussed SST, SSS, PAR, TSM, Chl a Nutrients, phytoplankton & bacteria enumeration, and flow cytometry. AAAT over Ny-Alesund increased from 2011 (-3.5 °C) to 2018 (-2.4 °C). He and his team reported the highest SST & SSS in 2011. In 2011, TSM increased towards the mouth attributed to wind direction. Increased warming is resulting in an increase in glacial meltwater influx. An increase in TSM affects water column properties. Warming is more conducive to photosynthetic heterotrophic flagellates than diatoms. Dominance of mixotrophs pan-Svalbard indicates shift in trophic structure.

**IMPORTANT DAYS IN THE MONTH OF AUGUST, 2023**

V. Sunitha

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**1 August: National Mountain Climbing Day**



National Mountain Climbing Day is commemorated annually on August 1. According to rumours, the holiday was created in honour of Josh Madigan and Bobby

Mathews, the author's son, who conquered all 46 of the Adirondack Mountains' High Peaks.

**1-7 August: World Breastfeeding Week**

Every year, during the first week of August, numerous nations around the world observe this global campaign. In 1992, the inaugural World Breastfeeding Week was observed.



**6 August: Hiroshima Day**



The sixth of August is designated as Hiroshima Day each year. Today marks the detonation of the atomic bomb over the Japanese city of Hiroshima.

**7 August: National Handloom Day**

Every year on August 7th, it is observed to honour the nation's handloom weavers. The sixth National Handloom Day is being observed this year.



**8 August: Quit India Movement Day**

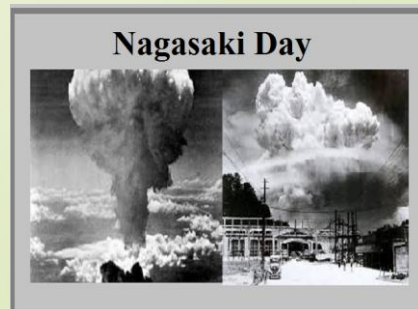


On August 8, 1942, during a meeting of the All India Congress Committee in Bombay, Mohandas Karamchand Gandhi introduced the "Quit India Movement."

August Kranti or the August Movement are other names for it.

**9 August: Nagasaki Day**

On August 9, 1945, the United States launched a second bomb on Japan at Nagasaki. This weapon is often referred to as "Fat Man." Three days after Hiroshima was attacked with an atomic bomb, it was dropped.





**9 August: International Day of the World's Indigenous Peoples**

The UN annually recognises August 9 as International Day of the World's Indigenous Peoples in an effort to increase awareness of the protection and advancement of indigenous peoples' rights.

**10 August: World Biofuel Day**



The purpose of this day, which is marked on August 10th, is to raise awareness of alternative fuel sources to fossil fuels.

**15 August: Independence Day in India**

India commemorates Independence Day on August 15 of each year. India gained independence from British domination as of this day. It serves as a reminder of a fresh start, the start of a new age free from more than 200 years of British colonialism.



**19 August: World Photography Day**

Every year on August 19th, World Photography Day is marked to promote awareness of the value of photography.

**19 August: World Humanitarian Day**



Every year on August 19th, people all over the world commemorate World Humanitarian Day to honour relief workers who put their lives in danger while providing humanitarian assistance. This day also recognises the contributions made by women to global challenges.

**20 August: World Mosquito Day**

Every year on August 20, people around the world observe World Mosquito Day to remember British physician Sir Ronald Ross, who in 1897 discovered that "female mosquitoes transmit malaria between humans."

**20 August: Sadbhavna Divas**

Every year on August 20th, Sadbhavna Divas is held to honour the memory of our late Prime Minister Rajiv Gandhi. Sadbhavna translates to "goodwill and genuine" in English.

**20 August: Indian Akshay Urja Day**

Every year on August 20th, Indian Akshay Urja Day is observed to promote the growth of renewable energy in India. Since 2004, people have been celebrating this campaign. Rajiv Gandhi, a former prime minister, was born on this day.



**22 August: Raksha Bandhan**



The celebration honours the enduring relationship between a brother and a sister. The Rakhi festival will be observed on August 22nd in 2021.

**22 August: Narali Purnima**

It is also referred to as Nariyal Purnima or Coconut Day, and it is enthusiastically observed throughout Maharashtra and numerous other locations bordering the Konkan region.



**30 August: Small Industry Day**

Every year on August 30th, Small Industry Day is held to support and promote small businesses.

**30 August: Janmashtami**

This year's celebration will take place on August 30. The Janmashtami festival commemorates the birth of Lord Krishna, often referred to as Kanha. He is regarded as one of Lord Vishnu's most potent human manifestations. One of the most joyous parts of the Janmashtami celebration is Dahi Handi.



**ENROLL YOURSELF TO NESA NEWSLETTER EDITORIAL BOARD MEMBER**

Editorial board members of NESA newsletter will be revised for the year 2023. All the interested applicants may send their curriculum vitae to **Editor in Chief** by **16<sup>th</sup> September, 2023**.



**MEMBERS ARE REQUESTED TO PLEASE PLANT ONE TREE IN YOUR NEIGHBOURHOOD AND SEND US A SMALL BRIEF WITH PHOTOGRAPH OF THE TREE / PLANT SO WE CAN PUBLISH IN THE NESA E-NEWSLETTER**



## KOMPETITIVE ALLELE SPECIFIC PCR (KASP) BASED GENOTYPING AND ITS APPLICATIONS

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### INTRODUCTION

Kompetitive Allele Specific PCR (KASP) is a genotyping assay that uses fluorophore-labelled oligonucleotides to detect specific single nucleotide polymorphisms (SNPs) within a DNA sample. KASP has been widely used for genotyping in various research fields due to its high accuracy, specificity, and cost-effectiveness. KASP genotyping is commonly used in plant and animal breeding, human genetics, and microbiology research.

### PRINCIPLE OF KASP

KASP™ genotyping assays utilize competitive allele-specific PCR technology to detect and score single nucleotide polymorphisms (SNPs) and insertions and deletions (Indels) at specific genomic locations. The assays are performed by adding a SNP-specific KASP Assay mix and a universal KASP-TF Master Mix to the DNA samples, followed by a thermal cycling reaction and an end-point fluorescent read. The KASP Assay mix contains two allele-specific forward primers and one common reverse primer, each with a unique tail sequence that corresponds to a universal FRET cassette labeled with FAM™ or HEX™ dye. The KASP-TF Master Mix contains universal FRET cassettes, ROX™ passive reference dye, taq polymerase, free nucleotides, and MgCl<sub>2</sub> in an optimized buffer solution, without Triton™ X-100.

During thermal cycling, the allele-specific primer binds to the template and elongates, attaching the tail sequence to the newly synthesized strand. The complement of the allele-specific tail sequence is generated in subsequent rounds of PCR, enabling the FRET cassette to bind to the DNA. The unquenched FRET cassette emits fluorescence, allowing bi-allelic discrimination through the competitive binding of the two allele-specific forward primers. Homozygous genotypes produce only one fluorescent signal, while heterozygous genotypes produce a mixed fluorescent signal.

### PROCEDURE OF KASP

The KASP reaction involves three steps:

- (i) PCR amplification of the DNA template
- (ii) Fluorescent signal detection, and
- (iii) Data analysis

The PCR amplification step involves the use of KASP primers and Taq polymerase to amplify the region containing the SNP of interest. The fluorescent signal

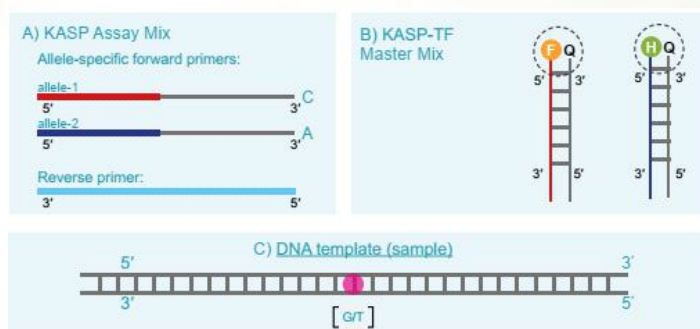
detection step involves the use of a real-time PCR machine, which detects the fluorescence emitted by the cleaved fluorophore-labelled oligonucleotides. The data analysis step involves the use of software to determine the genotypes of the samples based on the fluorescence signal intensity.

### PCR amplification of the DNA template

Prepare DNA samples: Isolate genomic DNA from your samples using a standard DNA isolation protocol. Concentrate the DNA and adjust the concentration to a suitable range for PCR (typically 10-50 ng/μl).

Prepare PCR reaction mix: The KASP genotyping assay consists of three components:

- (A) **KASP Assay Mix:** It consists of two allele-specific primers and one reverse primer
- (B) **KASP-TF Master Mix:** FRET reporting system (universal FAM and HEX labelled cassettes), DNA polymerase, ROX passive reference dye, dNTPs, MgCl<sub>2</sub>, Optimised buffer and
- (C) **Sample DNA:** that contains the single nucleotide polymorphism (SNP) being investigated.



Source: <https://www.biosearchtech.com/>

Prepare a PCR reaction mix using above components. The PCR reaction mix should be optimized to ensure efficient amplification of the target alleles.

Experimental procedure: The provided Table 2 demonstrates the process of creating 60 reactions intended for KASP genotyping in both 384- and 96-well plate formats. By following this method, you can produce an adequate amount of genotyping mixture for 33 samples and 3 no template controls (NTCs), along with some extra volume for backup.

Component	Wet DNA method (μL) for 60 reactions	
	384-well plate	96-well plate
Plate format	384-well plate	96-well plate
2x KASP-TF Master Mix	150	300
Assay Mix	4.2	8.4
Water	N/A	N/A
Total reaction volume	5	10

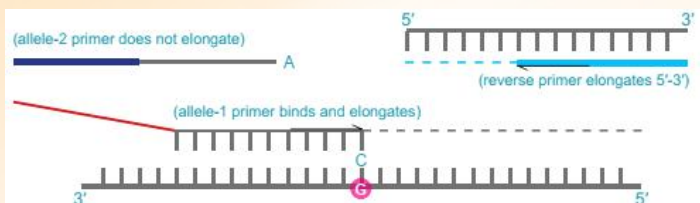


**Thermal cycling conditions:**

Step	Description	Temperature	Time	Number of cycles per step
1	Activation	94 °C	15 min	1
2	Denaturation	94 °C	20 sec	10 cycles
	Annealing/elongation	61-55 °C	60 sec (drop 0.6 °C per cycle)	
3	Denaturation	94 °C	20 sec	26 cycles
	Annealing/elongation	55 °C	60 sec	

**PCR round 1** – Denatured template and annealing components:

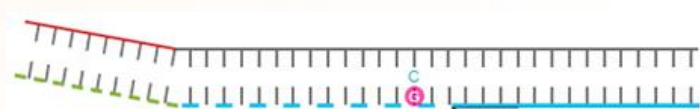
During the initial cycle of PCR, amplification of the target region occurs when one of the allele-specific primers is matched with the SNP of interest and with the common reverse primer.



Source: <https://www.biosearchtech.com/>

**PCR round 2** – Complement of allele-specific tail sequence generated:

In successive second round of PCR, the reverse primer binds to the allele-1 tail, elongates it, and produces a complementary copy.



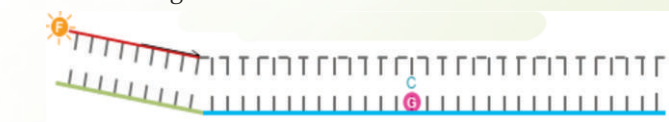
Source: <https://www.biosearchtech.com/>

During the initial cycle of PCR, amplification of the target region occurs when one of the allele-specific primers is matched with the SNP of interest and with the common reverse primer.

In successive second round of PCR, the reverse primer binds to the allele-1 tail, elongates it, and produces a complementary copy.

**PCR round 3 – Signal generation**

As PCR progresses, the amount of allele-specific tail increases. Consequently, the fluor-labeled portion of the FRET cassette binds to the newly formed tail sequences, causing the fluor to detach from the quencher and emit a fluorescent signal.



Source: <https://www.biosearchtech.com/>

**Fluorescent signal detection:** After performing PCR, the resulting plates should be analyzed using a suitable plate reader. The fluorescent plate reader is used to distinguish between different genotypes in KASP assays. This is achieved by utilizing specific fluorophores, such as FAM and HEX, which have unique excitation and emission wavelengths (485/520 nm and 535/556 nm, respectively). In addition, a passive reference dye called ROX (excitation at 575 nm and emission at 610 nm) is used to normalize any variation in the assay. The values obtained from FAM and HEX fluorescence are divided by the ROX values to ensure accurate analysis of the genotypes.

**Notes:**

1. In order to ensure accurate analysis of genotyping data, it is essential that plates be read at temperatures below 40 °C. Failure to read the plate below this temperature threshold may result in an inability to properly analyze the genotyping data.
2. To improve the accuracy of genotyping results, if distinct clustering patterns are not evident, it is recommended to perform three additional thermal cycling cycles on the plate and re-examine the data.

**DATA ANALYSIS AND RESULT INTERPRETATION**

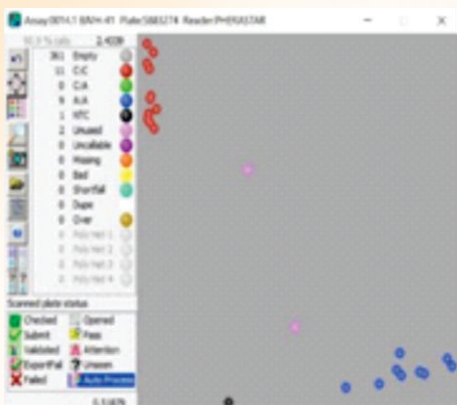
LGC offers three software options for interpreting genotyping data, each designed for specific aspects of the genotyping workflow.

- Kraken™ is a comprehensive software that

includes five modules, which can be used as needed. The modules are: (1) KASP Assay Picker, (2) Project Management, (3) Sample Management and Tracking, (4) Meridian Engine control interface, and (5) Genotyping Data Analysis and Reporting.

- KlusterCaller is a component of Kraken, which is focused solely on data analysis with fewer features.
- SNPviewer is a software package used for graphical viewing of genotyping data.

It is important to note that other commercially available data interpretation software may also be appropriate for analyzing genotyping data.



When visualizing genotypic data through a plot, if there are too many genotyping groups present, it is possible that a non-target polymorphism exists in close proximity to the SNP of interest in the KASP Assay. This can make it difficult to accurately determine the heterozygotes and homozygotes for the different clusters. To resolve this issue, it may be necessary to relocate and design at least one of the primers in order to prevent the occurrence of any unwanted polymorphisms. Another potential solution is to include a wobble base in the primer at the site of the neighboring SNP. Both of these strategies can help to ensure that genotyping data is more accurate and reliable.

**ADVANTAGES OF KASP**

KASP has several advantages over other genotyping methods, including:

- (I) High throughput, allowing for the genotyping of multiple samples simultaneously.
- (ii) High accuracy and specificity, with a low rate of genotyping errors.
- (iii) Cost-effective, due to the small quantity of reagents and samples required for the assay.
- (iv) KASP is a flexible and adaptable technology that can be customized for specific genotyping needs, such as SNP discovery, association mapping, and marker-assisted selection in plant breeding.

**APPLICATIONS OF KASP:**

KASP genotyping has been widely used in various research fields for high-throughput genotyping, including: (i) Plant and animal breeding, for the selection of desired traits and identification of genetic markers. (ii) Human genetics, for the identification of disease-causing mutations and genetic variations associated with complex diseases. (iii) Microbiology research, for the identification and differentiation of microbial species. Here are some examples of KASP technology's applications:

**Crop improvement:** KASP has been used to identify single-nucleotide polymorphisms (SNPs) associated with important traits in crops, such as yield, disease resistance, and quality. For example, KASP was used to identify SNPs associated with Fusarium head blight resistance in wheat, yield related traits in peanut and drought tolerance in rice. KASP genotyping has facilitated rapid generation advancement in several crops through its use in marker-assisted breeding.

**Clinical diagnosis:** KASP has been used in clinical settings to diagnose genetic disorders, such as cystic fibrosis and hemophilia. KASP provides a rapid and accurate method for genotyping patients, which can help guide treatment decisions.

**Environmental monitoring:** KASP has been used to monitor genetic diversity in populations of endangered species and track the spread of invasive species. For example, KASP was used to monitor the genetic diversity of Atlantic salmon populations in Scotland and track the spread of Japanese knotweed in the United Kingdom.

**Population genetics:** KASP technology has been used to study the genetic diversity and population structure of various species. For example, KASP technology was used to study the genetic diversity of Atlantic salmon populations in Canada and the population structure of olive cultivars in Italy.

**Evolutionary biology:** KASP technology has been used to study the evolution of species and their relationships. For example, KASP technology was used to study the phylogeny and evolution of the grass genus *Melica*.

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## NOTIFICATION NO. 2

# APPLICATIONS ARE INVITED FOR NESA ANNUAL AWARDS – 2023

LAST DATE: **30<sup>th</sup> September, 2023**



This is to notify that applications are invited for the NESA Annual Awards 2023 from the Life Members of the Academy. The prescribed application forms for the following categories can be downloaded from our website: [www.nesa-india.org](http://www.nesa-india.org) • <http://nesa-india.org/award-form-submission/>

Separate applications should be submitted for independent awards. For detail guidelines the website of NESA may be approached by logging on.

The last date for all the categories of awards is **30<sup>th</sup> September, 2023**. The venue and the brochure will be shared soon.

The categories of Awards are given as under:

- (1) NESA FELLOWSHIP AWARD
- (2) NESA INTERNATIONAL SCIENTIST AWARD
- (3) NESA EMINENT SCIENTIST AWARD
- (4) NESA INDIGENOUS TECHNICAL KNOWLEDGE (ITK) AGRICULTURE AWARD
- (5) NESA SCIENTIST AWARD
- (6) NESA ENVIRONMENTALIST AWARD
- (7) NESA GREEN TECHNOLOGY INNOVATIVE AWARD
- (8) NESA DISTINGUISHED SCIENTIST AWARD
- (9) WOMEN EXCELLENCE AWARD
- (10) NESA YOUNG SCIENTIST AWARD
- (11) NESA JUNIOR SCIENTIST AWARD

**Contact for more details:**

**Mobile : 98112 38475, 8527568320; 9971383650**

National Conference  
On  
**Recent Trends & Challenges in  
GREEN CHEMISTRY, POLLUTION CONTROL AND  
CLIMATE CHANGE [GPCC-2023]**

**14<sup>th</sup> – 16<sup>th</sup> December 2023**

**Venue: CSIR – National Botanical Research Institute, Lucknow**



Jointly Organized by



National Environmental Science Academy (NESA), New Delhi

CSIR-National Botanical Research Institute, Lucknow

**Thematic Areas of the Conference - GPCC-2023**

Abstracts can be submitted under the following sub-themes

**1. Pollution and its Mitigation**

- ❖ Air Pollution and Mitigation
- ❖ Water Pollution and Mitigation
- ❖ Soil Pollution and Mitigation
- ❖ Wastewater Utilization
- ❖ Waste Management

**2. Climate Change**

- ❖ Climate Change Mitigation
- ❖ Climate Smart Agriculture
- ❖ Renewable Energy
- ❖ Application of Remote Sensing and GIS

**3. Green Chemistry**

- ❖ Alternative and Efficient Sources of Energy
- ❖ Green Technologies for Zero-waste Processes and Products
- ❖ Green Nanomaterials for Environmental and Agricultural Applications
- ❖ Cleaner Production

**4. Environment and Biotechnology**

- ❖ Environmental Microbiology and Bioremediation
- ❖ Environmental Biotechnology

**5. Natural Resource Management**

- ❖ Biodiversity Conservation
- ❖ Environmental Degradation and Eco-restoration
- ❖ Geospatial and Ecological Modelling

**6. Contemporary Areas**

- ❖ Environmental Impact Assessment
- ❖ Environmental Risk Management
- ❖ Environmental Protection
- ❖ Environmental Sustainability and Development
- ❖ Environmental Education and Sustainable Developments Goals

**SUBMIT ABSTRACT**  
[nesalucknowconference2023@gmail.com](mailto:nesalucknowconference2023@gmail.com)

**IMPORTANT DATES**

Conference Dates	14th to 16th December, 2023
Registration and Abstract Submission Starts:	10.07.2023
Last Date of Registration without late payment:	31.10.2023
Abstract submission Deadline:	31.10.2023
Intimation of acceptance of abstract:	07.11.2023

**REGISTRATION**

	Regular Registration (Till 31.10.2023)	Spot Registration* (After 31.10.2023)
Academicians & Scientists	INR 5000.00	INR 6000.00
Research Scholars/ Fellows	INR 2500.00	INR 3000.00
Students (PG)	INR 1500.00	INR 2000.00
Corporate Delegates	INR 10000.00	INR 12000.00

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&

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