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Vitamin -D Deficiency
High among North Indian Women

What is Vitamin D?

A fat-soluble vitamin naturally present in very few foods, added to others, and available as a dietary supplement. It is also produced endogenously when ultraviolet rays from sunlight strike the skin and trigger its synthesis.

Vitamin-D deficiency is leading to increasing incidence of obesity and diabetes among Indian women, according to a new study in *British Medical Journal* (BMJ).

Findings of the cross sectional population-based study shows 68.6% women in India are Vitamin-D 'deficient', whereas almost 26% have been marked 'insufficient'. Only 5.5% of women in the country have sufficient amount of vitamin-D.

The study has been conducted by researchers from the All India Institute of Medical Sciences (AIIMS), Diabetes Foundation of India and National Diabetes, Obesity and Cholesterol Foundation. Vitamin-D deficiency is a major public health problem worldwide. Several studies in India have shown high prevalence of vitamin-D deficiency and its association with obesity.

However, the latest study was conducted particularly among women population with risk of diabetes. The researchers argue that women in India are more likely to have vitamin-D denciency because many of them are confined to households and have high coverage of body with clothes, reducing their exposure to sunlight.

Findings point to high vitamin-D deficiency among women in north India, particularly those belonging to the lower socio-economic strata. "It is important to note that low vitamin-D levels and inadequate intake of calcium may predispose post-menopausal Indian women to bone fractures. Pre-diabetes is associated with abdominal obesity, insulin resistance, non-alcoholic fatty liver disease and metabolic syndrome, and such individuals are at an increased risk for developing type-2 diabetes and cardiovascular diseases," it said.

"We believe that these are very important observations, in variance to many studies done in Whites. What remains to be seen is if we supplement Vitamin-D in Indian women, would it lead to better blood sugar and bones..." says Dr Anoop Misra, Chairman, Fortis C-DoC, one of the authors of the study.

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Interview

'70% of Small Rivers in India have Died' An interview with Rajendra Singh, *Jal Purush*

RADHESHYAM JADHAV

Niti Aayog of India recently came out with a Composite Water Management Index to assess and improve performance in efficient management of water resources. Some of the report's findings are alarming : 600 million Indians face high to extreme water stress and India ranks 120th among 122 countries in water quality index. Water conservationist **Rajendra Singh** recipient of the Ramon Magsaysay award and Stockholm Water prize, for his efforts to galvanise community based water harvesting and water restoration efforts—spoke about sustainable solutions to tackle India's water crisis:

Q. What are your observations on Niti Aayog's Composite Water Management Index?

A. Niti Aayog's report presents a dangerous scenario. It also reflects that MGNREGA is not going in the right direction when it comes to river rejuvenation. MGNREGA model was based on our work and was expected to create water assets. But it was not taken seriously. The money was used for building roads, constructing toilets, etc. If money and efforts were put to construct johads (rainwater storage tank) and recharge water aquifers, India's rivers would not have died. The money meant for water projects has been misused and corruption is rampant.

Q. But haven't some states done constructive work in water conservation?

A. I would rank Maharashtra's Jalyukt Shivar programme at the first place. The state has done a good job of rejuvenating small rivers. I would rank Telangana and Karnataka at second and third place respectively for doing good work under MGNREGA. Other states have wasted the opportunity.

Q. What is the way forward to save our rivers and tackle the water crisis?

A. India needs a river literacy movement. There is need to include river and water literacy in the curriculum. All river basins must have resource mapping and community driven water harvesting, and conservation structures must be created. Contractors must not have a place in these works and people must lead from the front. There is a need to classify river water as per the usage. It is a must for efficient use of water. 'A' class water must be allocated for drinking. 'B' class water for growing vegetables and food grains, and 'C' class water for industries, etc.

Q. Do you think more efforts are needed to encourage public participation in water conservation projects?

A. There are no serious efforts to encourage public participation. The government's definition of public participation is meeting, eating and cheating. The government calls meetings as part of public participation, feeds people and then cheats them by changing meeting proceedings. There is no point in such public participation. I have been talking about this for the last ten years at national and international forums. But nobody is willing to hear the truth.

Q. Are communities coming forward for popular voluntary participation to save rivers?

A. In many states, people have joined hands to save rivers and are putting pressure on governments. Public participation is only meaningful when people and government hold equal stakes in planning and execution of water projects.

Q. What efforts are being made to take forward the Arvari Sansad (Arvari river parliament) model?

A. At government level there are no efforts made in this direction. But we are trying to implement this model at the national level by launching community driven river rejuvenation programmes. About 70% of small rivers in India have died. Rejuvenation efforts are possible only in places where people have taken initiative and we are ensuring that community participation increases. The river parliament model focusses on river basin approach and it aims to encourage participatory, equitable and decentralised water management by stakeholders.

Q. Is water crisis in rural areas prompting massive migration to cities?

A. It is necessary to ensure that rural areas get enough water. In absence of water, massive migration to cities will continue and major chunk of migrated population will not return to villages. Migration to cities would stop if water is made available in villages as water availability is directly linked to health, employment and overall well-being.

Q. You have strongly opposed government's river linking project. What alternative do you suggest?

A. Community driven decentralised water conservation and harvesting structures will help India to fight water crisis. Water conservation efforts must involve people and not contractors.

An Ecological Emergency

India must lead the battle against pollution

SHYAM SARAN

Former Foreign Secretary of India
and a Senior Fellow, Centre for Policy Research.

Erik Solheim, the executive director of the United Nations Environment Programme (UNEP), was in Delhi recently to announce, along with the Union Minister of Environment and Forest, Harsh Vardhan, that India will be the global host for this year's World Environment Day (WED) on June 5. The day (WED) has been observed every year since 1974 after a decision taken at the World Environment Conference of 1972. Each year, the activities are centered on a particular theme. This year, the focus is on plastic pollution ("Beat Plastic Pollution").

According to UNEP, the world uses 500 billion plastic bags and, in the last decade, produced more plastic than the whole of the 20th century. What is more, about eight million tonnes of plastics are dumped into the ocean each year, killing a million sea birds and 100,000 sea mammals.

What is worse, 50% of the plastics consumed are for single use, which adds to the volume of waste. Some categories of plastics may persist in the earth's ecology for 500 years. In India, plastic litter is everywhere from beaches to mountains because people do not think twice before dumping it. Plastics in oceans break down into micro elements, which are then ingested by fish and find their way into the food chain. In India, stray cattle are seen feeding on plastic waste. If India is to live up to its role as host of the WED, it must take the lead in tackling plastic pollution that threatens to engulf and strangulate an already fragile ecology.

There are some hopeful signs. India has a very high rate of recycling of plastic waste, thanks to its army of poor and hardworking ragpickers. They not only pick up all kinds of waste, but sort them out and aggregate them, making it much easier to recycle. But for their contribution, India's problem of waste management, already a major preoccupation, would be an even bigger challenge. Their role needs to be acknowledged and an effort should be made to integrate them into a well-structured recycling chain, which is not only efficient but also ensure reasonable compensation for their hard work.

Some useful research has been done in converting plastic waste into biodiesel for commercial use. This should be intensified rapidly since it also contribute to the country's energy security.

Sikkim has been a pioneer in making the state plastic free. The use of bottled drinking water has been banned but at the same time clean potable water is made available through water ATMs. These have been introduced in some locations in Delhi as well. A concerted drive to provide such ATMs across cities would not only reduce the use of plastic but also yield significant health benefits by making clean potable water available to people. According to UNEP, a million plastic bottles are consumed every minute in the world and Indians are major consumers.

As host of the WED, India must tackle the problem of air pollution, which has become a major health hazard. One should study the experience of Beijing, which has achieved a dramatic reduction in air pollution after years of being one of the world's most polluted cities. It is now our capital city, Delhi, which has assumed that sorry mantle. One of the major sources of air pollution in some Chinese cities has been the use of coal for domestic heating in winter. This has now been stopped and relatively cleaner gas is being promoted instead. In Indian cities, nearly 20-25% of daily cooking is still through burning biomass and urban waste, a significant source of air pollution. If this could be gradually reduced through greater use of LPG, there would be a positive impact on air quality.

It is unfortunate that year after year the problem of extensive burning of crop residue in northern Indian states continues to persist despite there being cost-effective solutions. There are machines available not only to extract crop residues but to aggregate and compact them and even use them as organic fertiliser. While they may be expensive for individual farmers to buy, they can be leased for use through farmer service centres on nominal payment. The problem of winter haze in northern India would be resolved once and for all.

Solheim has welcomed India's decision to host the WED and his agency is more than ready to offer its cooperation to help the country meet its environmental goals. Let India emerge as a global example in preserving our threatened ecology.

COCONUT and its WATER

VIR SANGHVI

Almost everyone who grew up in the city of Bombay —as it was then, before Bal Thackeray changed the name will have his or her own coconut water memory. Mine consists of walking along the seaside at Worli in the evenings and then, as a special treat, being allowed to buy *nariyal paani* from a roadside seller. The ritual was always the same.

The hawker would ask, "*Paani ya malai*?"

This meant : did I want coconut that was full of water or did I want one that had water along with some of the tender flesh?

As I remember it, I always took a minute or two to mull this over in my head before giving exactly the same answer each time : "*malai-wallah*."

The coconut-seller would lop the head off a green coconut with a curved knife and then offer to put a straw inside the open coconut. I would always refuse, preferring to raise the coconut to my lips and to drink directly from the fruit without the intervention of the straw. Once I had drunk all the water, a process that rarely took more than a minute, I would hand the coconut back to the seller.

He would put a knife into the coconut and scrape off the flesh from its insides. I would push my fingers deep into the coconut and pull out the delicious *malai*. When I was convinced that there was no more *malai* to be excavated, I would look at him accusingly.

"*Upar-walah malai kahan hai*?" I would demand petulantly. The coconut -seller would then produce the top of the coconut that he had lopped off. Sure enough, it would have a layer of *malai*. This would also be scraped off and I would greedily consume it before asking my parents if I could have a second coconut. (For some reason, they always said no.)

As the years went by, I began to note the gentrification of the roadside coconut. If you went to resort hotels in such places as Goa, they welcomed you with an open coconut in its own little basket, draped in a napkin. In these situations, it was not acceptable to throw away the straw, let alone to demand, once you had drunk the water, "*Malai kahan hai* ?"

The more I travelled, the more I saw of the coconut. When I first went to Kerala, the coconut capital of India, I was startled to find that often, when you asked for a coconut, a boy would scurry up a tree, cut one from the branch and bring you the freshest coconut you had ever eaten.

Elsewhere in the world, the Thais have turned the cutting of the coconut fruit into a performance spectacle. On the island of Samui, they train monkeys to climb up trees and pull down coconuts for the benefit of tourists. (Can you imagine how excited I would have been as a little boy in Worli if the local *madaari* had joined forces with the *nariyal paani-wallah* and sent his *bandar* up the tree to find me my coconut?)

By the time I moved to Calcutta and discovered that *daab* or coconut water was a really big deal for Bengalis, I was used to the wonders of the coconut and its water. The Bengalis are well-versed in the coconut milk. This is quite different from coconut water and is not fruit juice at all but something you make from the flesh of the coconut. One of their most famous dishes, cooked in a whole coconut, is *daab chingri* but despite the name, it uses coconut milk, not *daab* as in coconut water.

But they value the water too. Not only do they drink it, they also claim medicinal properties for it. It is a sort of natural Lacto Calamine for Bengalis : they say that it is good for the skin, that is removes chicken pox marks, that it should be applied on hives and that it keeps the complexion smooth. I have no idea if these claims have any medical basis but my guess is that, as with all folk wisdom, there must be something to the belief.

What the Bengalis do not claim is that coconut water is the perfect gym drink. They do not consume it as a sort of energy-giving Red Bull. And their film stars (such as they are) do not long to be photographed drinking daab.

And yet, bizarrely, this is precisely how coconut water is beginning to be regarded in the West. According to a recent article in the London *Times*, such celebrities as Madonna, Sienna Miller and Claudia Schiffer drink coconut water all the time as an energy drink. Their fondness for coconut water has led to a boom in the sales of bottled coconut water. This stuff is not cheap. Vita Coco, a brand of bottled coconut water costs $4.49 per litre or Rs. 340 or so for a single container the size of a mineral water bottle.

So great is the demand for coconut water in the West that the big multinationals are all getting in on the craze. Pepsi Co has bought Brazil's largest coconut water producer. Coca-cola spent $15 million on a stake in Zico, a maker of coconut water. And the overpriced Vita Coco is not just drunk by celebrities, it is also increasingly owned by them. Among those who have bought stakes in the company are Matthew McConaughey, Madonna, Demi Moore and the lead singer of the Red Hot Chili Peppers (some mistake surely? shouldn't he be buying a stake in Tabasco?).

So what accounts for the global trendiness of a drink that most Indians take for granted?

The answer has to do with health. It is well-known that coconut water mixes easily with blood. Ever since World War II, army medics have frequently used coconut water for transfusions. Moreover, it is also high in electrolytes which are regarded as essential for the proper functioning of the human body.

But now, new claims are being made for the healthy properties of coconut water. It is said that while most sports drinks (the so-called energy drinks) have electrolytes added artificially, coconut water contains them naturally. The reason energy drinks are consumed during workouts or after is because they reduce the possibility of dehydration (from sweat), replace electrolytes lost during the exercise and enhance the absorption of carbohydrates from the gut. According to coconut water fanatics, energy drinks are synthetic in nature and contain lots of sugar. On the other hand, coconut water has the same beneficial effects (because of its electrolyte content) and has much less sugar than the average energy drink. Moreover, it is ideal for rehydration because it has a water content of 94 per cent. This makes it nature's diet drink. It has virtually no fat and only 46 calories per glass.

Other claims have also been advanced for coconut water but with less medical foundation. Proponents say that regular drinking of coconut water can lower blood pressure and reduce the risk of heart attacks. It is also said that coconut water can help boost metabolism and cause the body to burn calories more quickly than usual.

Other claims have to do with mineral content. The drink has ten times as much potassium as the average sports drink (and double the potassium content of a banana). During times of intense physical activity, potassium is leached from the blood so coconut water serves as a useful source of replacement potassium. This is why celebrity fitness trainers now encourage their movie star clients to drink coconut water after workouts. (Frankly, I'm not sure I understand this. If potassium is so vital during workouts then why don't they just add more of it to energy drinks? It can't be that difficult to do.)

The interesting thing about the coconut water explosion is that even the greatest proponents of the drink make very little of the India connection. In much of the West, coconut water is associated with South America or the West Indies. In the US, a bestselling brand of coconut liqueur is called Malibu after a part of California, not to my mind the centre of coconut-growing world. Even the investments in coconut water companies have been made in South American operations rather than Asian plantations.

This is odd. There is no uniformity of opinion on the origins of the coconut, but many experts believe that the tree first grew in South Asia. Unlike most other fruit and vegetables which are shown to have originated in the Americas, the coconut is one that we can proudly claim for ourselves. The Thai and Indonesian versions seem to have reached there from our shores.

Only Indians understand the coconut. It's part of the Hindu religion. It provides employment to millions in one form or another. It is the symbol of Kerala, India's greenest state. And it is the one fruit that unites both Indian coasts—they drink the water by the Bay of Bengal and on the shores of the Arabian Sea.

It seems to me that we are missing out on a great opportunity. Now that coconut water is an international phenomenon, we should stake our own claim. We should tell the health fanatics what every Bengali knows: don't just drink it, smear it on your skin.

And at the very least, we should teach the world to ask after each gulp of coconut water: "*Lekin malai kahan hai*?"

(From *Hindustan Times*, Sunday magazine)

Honour to Dr. S.K. Gupta

Dr. Salil Kumar Gupta, the noted acarologist of India, who is also well known in the world, has been recently honoured by giving him the "Lifetime Contribution Award—2018" by the Zoological Society, Kolkata, in their 72nd AGM, held at Ballygunge Science College, University of Calcutta.

He had been trying to develop acarology in India for over 50 years, by being author of about 10 books, 260 research publications, and editing 8 seminar proceedings. By all these the acarology in India stands on a strong footing. Besides, he is intimately engaged in teaching of the post graduate classes as well as guiding Ph.D. students, 14 of those have already received their degree. He has travelled extensively in different parts of the world for attending international conferences and as a visiting scientist.

Dr. Gupta earlier served as a Principal Scientist in the ICAR at Bangalore. After suerannuating in March 1997, from the high post of 'Scientist F' in the Zoological Survey of India, he has continued to lead his research career with the Medicinal Plants Research & Extension Centre, Ram Krishna Mission, Narendrapur, Kolkata, on acarology projects.

A Walk among the Flowers in India

BRINDA GILL

From Jammu & Kashmir to Tamil Nadu and from Maharashtra to Arunachal Pradesh, India is home to over 15,000 species of flowering plants including Roses, Orchids, Rhododendrons, Wild Flowers, Lilies, Lotus Blooms, The legendary Brahma Kamal and more.

The sight of trees with birds in their foliage, the comfort of their shade, the delight of their fruits, and the music of their rustling leaves is a balm for the senses. Add to this the sight of flowers on trees, and the joys of nature are multiplied manifold.

India is home to over 40,000 species of plants including over 15.000 species of flowering plants. Some of the flowers can be spotted in solitary splendour, others in swathes; some are perennial, others annual, and still others flower once in several years. Some draw sustenance from the soil, some from other plants, and still some from the atmosphere. Many of these flowers grow in their natural habitat, enhancing the experience of seeing them and enjoying their beauty.

KAAS PLATEAU, SATARA
(MAHARASHTRA)

Solitary flowers, clusters of flowering plants, and carpets of flowers saturate the senses with their beauty at Kaas plateau during the monsoons. Located 1,200 m above sea level in the Western Ghats, near Satara, Maharashtra, this plateau spread across 1,792 hectares comes alive in the rainy season as it receives an average annual rainfall of 2,000 to 2,500 mm, which sets off a chain of mass flowering.

Nearly 1,500 species of plants including grass, herbs, medicinal plants, wild flowers, orchids, creepers and more grow at and around the plateau. Of these, over 450 species of wild flowers bloom in the monsoon, delighting visitors. Kaas Plateau is a UNESCO World Heritage Site under the natural heritage criteria.

SESSA ORCHID SANCTUARY
(ARUNACHAL PRADESH)

From single flower plants to stalks clustered with blooms and from pale to brightly coloured, plain to elaborate, regular flowers to those that look like an insect or a lady's slipper—the beauty and form of these orchids takes the breath away. Home to more than 600 species of orchids, Arunachal Pradesh is often called Orchid Paradise.

Get to know more about these flowers at the Orchid Research and Development Centre and Sessa Orchid Sanctuary, Tipi, Arunachal Pradesh. The sanctuary houses nearly 200 species of orchids. Being seasonal, different varieties bloom at different times of the year; the best months to visit Tipi to see the orchids would be from October to April.

THE NILGIRIS
(TAMILNADU)

The Nilgiris or the Blue Mountains of Tamil Nadu fall under the UNESCO Man and Biosphere Programme owing to their biodiversity. Interestingly, the region is said to derive its name from the beautiful blue flowers of Neelakurinji or *Strobilanthes kunthiana*, which blooms only once in 12 years, breathing new life into the place.

Typically Neelakurinji flowers between July and December with peak flowering in August and September. The genus has different species with varying flowering cycles that grow in different areas such as Kodaikanal in Tamil Nadu and Munnar in Kerala.

BARSEY RHODODENDRON SANCTUARY
(SIKKIM)

In parts of the Himalayas, flowering of rhododendrons heralds the onset of spring. The burst of beautiful flowers in exuberant colours is one of nature's most eloquent expressions of the season.

Among the most scenic places to experience the exquisiteness of rhododendrons is Barsey Rhododendron Sanctuary, located at an altitude of 2,000 to 4,100m in west Sikkim.

The rhododendron season is from around end March to early May. The invigorating air, nature trails, a wide variety of rhododendrons flowering in the forests, the uniqueness of each species, and panoramic views make for an unparalleled tryst with nature.

NUBRA VALLEY, LADAKH
(JAMMU & KASHMIR)

A cold desert has its own rhythm of life. Like the trans-Himalayan Ladakh region, comprising districts of Leh and Kargil, and spread across valleys, mountains, glaciers and large tracts of land rendered inaccessible by the harsh winters.

However, with winter gone, the melting snow serves as food for a rich variety of vegetation. The mountain slopes and meadows breathe anew with a burst of flowering plants including medicinal and aromatic plants.

Take in views of the flowers at Nubra Valley (the word Nubra is believed to stem from Ldumra which means Valley of Flowers) during the flowering season from June to Sep-

tember; August is recommended for viewing flora.

VALLEY OF FLOWERS
(UTTARAKHAND)

The Himalayas, both western and eastern, are where you can best experience the cycle of seasons. In winter, the land lies cold, often covered in snow, and flowerless but come summer and the place is transformed with scores of flowering plants.

Enjoy a rendezvous with alpine flora at the high-altitude Valley of Flowers National Park, Uttarakhand, as you trek through mountains and meadows and across streams, along with pilgrims making their way to Hemkund Sahib. Amidst orchids, lilies, poppies, saxifrages and more, spot the revered Brahma Kamal, the state flower of Uttarakhand. The flowers start blossoming as it gets warm in May and the flowering continues till September.

Tips to See Flowers

- Recommended Reading : Common Indian Wild Flowers by Isaac Kehimkar, Bombay Natural History Society, Hardcover http:// www.amazon.in/Common-Indian-Wild-Flowers-Natural/dp/0195656962.
- Browse http://www.flowersofindia.net to familiarise yourself with the wonderful world of Indian flowers.
- It is best to go seeing flowers with a naturalist who will identity different species and explain their characterstics. Mornings are recommended.
- Nature India —Eco Tours http:// www.natureindiatour.blogspot.in/ organises nature trips.
- DCP Expeditions LLP organises nature trips and nature photography trips www.dcpexpeditions.com
- Do not walk on or pluck flowers.

Meghalayan Age
Name given to 4,200 yrs of Earth's Age

Stalagmites on the floors of the Krem Mawmluh caves in Meghalaya provide evidence of a distinct stage in the geologic classification of Earth's age, so say researchers who have termed this most current time-span in the planet's 4.6 bn-year-old history the 'Meghalayan Age'. These slices of time chart key events in the story of evolution of our planet and the life forms that occupy it. A look...

HADEAN 4.6-4 bn years ago. Named after Hades (Greek god of underworld), the informal eon describes hellish conditions on an Earth which has just formed.

ARCHEAN 4-2.5 bn years ago. Continents and Oceans were formed. Oldest evidence of life found on a 3.95 bn-years-old-rock formed in this period.

PROTEROZOIC EON 2.5 bn to 541m years ago. Primitive life form—bacteria and blue-green algae—flourished around shallow margins of continents formed during this period.

PHANEREZOIC EON 541m years to present. The eon of visible life, saw the development of plants and release of free oxygen that helped rapid evolution of various life forms.

CAMBRIAN 541m to 485.4m years ago. Jawless vertebrates, soft-bodied organisms, animals with shell.

ORDOVICIAN 485.4m to 443.8 yrs. Rise of fish in the sea and first plants on land.

SILURIAN 443.8m to 419.2m yrs. Vascular plants (plants with food and water conducting tissues) began to colonise coastal lowlands.

DEVONIAN 419.2m to 358.9m yrs. Also known as the age of fishes due to its fish diversity, this period saw emergence of forests on land, four-legged amphibians also appeared and animal life started colonising land.

CARBONIFEROUS 358.9m to 298.9m yrs. Coal, natural gas and liquid petroleum were formed during this period.

PERMIAN 298.9m to 251.9m yrs. Terrestrial plants diversified, insects envolved rapidly, several reptile lineages appeared. The largest mass extinction in the Earth's history occurred during the latter part of this period.

TRIASSIC 251.9m to 201.3m yrs. Dinosaurs appeared at the beginning of this era. The latter part saw appearance of first mammals-tiny, fur-bearing animals derived from reptiles.

JURASSIC 201.3m to 145m yrs. On land, dinosaurs and flying pterosaurs dominated the ecosystems, and birds made their first appearance.

CRETACEOUS 145m to 66m yrs. Flowering plants arose in the beginning of this period. The period ended with a large mass extinction that finished off dinosaurs and marine and flying reptiles.

PALEOGENE 66m to 23.03m yrs. After & due to extinction of dinosaurs, mammals starting from rodent-size grew in size, number and diversity.

NEOGENE 23.03m to 2.58m yrs. Elephants, apes, rabbits, pigs, sabre-toothed cats, horses, rhinos roamed Earth.

The Meghalayan Age starts at 4,200 years ago when agricultural societies around the world experienced an abrupt and critical mega-drought.

Hover-flies (Diptera: Syrphidae) in the collection of the Annamalai University, Chidambaram, Tamil Nadu

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Introduction

Presented in this paper is the result of the examination of whatever Syrphidae I managed to find in the collections of the Annamalai University (1929-) at Chidambaram, maintained in the Department of Entomology in the Faculty of Agriculture there. I had visited there from August 25th to 28th, 2016 and was permitted study of their insect collections through courtesy of Prof. Dr S. Manickavasagam. A couple of hours examination of the 50 Syrphidae specimens that were located there resulted in the following 13 species (of 10 genera) being identified, which are enumerated below, with pertinent annotations on each of them. Other published records of Syrphidae from Tamil Nadu and other parts of southern India, vide Ghorpade et al. (2011: 79) were published by Ramakrishna Ayyar & Krishna Ayyar, 1933 (not seen); Cherian, 1934; Usman & Puttarudriah, 1955; Kalyanam, 1970; Datta & Chakraborti, 1986 and Joseph & Parui, 1986. Those species not found by me in Annamalai Univ., Chidambaram have also been variably mentioned below, the most frequent hover-fly species usually occurring in this biogeographical sub-area of the "Tamilnad Carnatic," a coastal strip in the extreme southeastern corner of the Indian landmass. Chidambaram lies just a few kilometres north of the famous seacoast of Tranquebar [= Tharagambadi] and the recent destruction of that place by the tsunami leaves Chidambaram as the nearest place where old types from Tranquebar could be collected from, if still flying. The Indian political States/Union Territories in southern India, i.e., Karnataka, Goa, Telengana, Andhra Pradesh, Tamil Nadu, Pondicherry and Kerala are covered. For floristic data, reference may be made to Matthew (1982, 1983) and Mani (1974). The data in the paper on south Indian Syrphidae (Cherian, 1934) and Joseph & Parui (1986) are also included here, with notes on, and corrections of, the identities of species listed by them.

This is the tenth faunistic study of Indian sub-continent Syrphidae by me, after my papers on Syrphidae in the eastern coastal portion of the south Indian State of Andhra Pradesh (Ghorpadé et al., 2011), another on Pakistan Syrphidae (Ghorpadé & Shehzad (2013), on Afghanistan Syrphidae (Ghorpadé, 2014b), the Panjab University, Chandigarh collection (Ghorpadé, 2014c), that on the PAU, Ludhiana collection (Ghorpadé & Pathania, 2014), on the Nepal Himalaya Syrphidae (Ghorpadé, 2014d), on Syrphidae of the North-West Frontier (Ghorpadé, 2015), on Tripura (Ghorpadé & Anooj, 2016), again on Pakistan (Shehzad et al. (2017) and on Poonch District, Azad Kashmir [=P.O.K.] (Hassan et al., 2017. The Tamilnad Carnatic is also an almost completely deforested country, and equally extensively farmed, with little natural tree and other wild vegetation remaining now. I again noticed a "sea of paddyfields" during my tour of this State in August--September 2016, but several pulses and chilli peppers are also grown in the alluvial red soil here. University campuses there also have horticultural gardens and 'forest' plantation plots where Syrphidae could be frequent visitors to flowering plants (native and cultivated) there, as well as occurring on flowers of field crops like nigerseed, safflower, sunflower and others, and perhaps engaging in their pollination also as also of the mangrove tree *Excoecaria agallocha* L. (Euphorbiaceae) ?

Ghorpadé et al. (2011: 79) had given a summary account of Syrphidae faunistics in India, citing all major published references in that paper. I have recently published (Ghorpadé, 2015) a detailed summation of Syrphidae recorded from the "North-West Frontier" of the Indian subcontinent, which area has mostly Palaearctic and Afrotropical elements occurring and, actually, just a limited number of the real, 'Oriental' fauna, which latter flies in the rest of India and in the other south and south-east Asian countries (see also Mani, 1974).

Chidambaram (11.39°N, 79.69°E) is a temple town in Cuddalore District of Tamil Nadu, located some 215km south of Chennai (erstwhile Madras) between the Vellar and Kollidam (erstwhile Coleroon) Rivers. It almost abutts the Bay of Bengal where the Pichavaram mangroves and wetlands are situated, with *Excoecaria agallocha* L. (Euphorbiaceae) tree dominated forests (Matthew, 1982: 638, 1983: 1442). This area was under the Chola, Pandya and Pallava kingdoms of yore and is dotted with many Shiva temples.

The records of Syrphidae and their prey compiled by Ghorpade (1981a) from localities in Tamil Nadu have been incorporated under the relevant predacious species documented below, for information.

Systematic Account

Order DIPTERA
Family SYRPHIDAE
Subfamily ERISTALINAE
Tribe ERISTALINI

1. *Eristalinus arvorum* (Fabricius, 1787)

Eristalis arvorum Fabricius, 1787, Mantissa Insectorum, 2: 335 (♂ ♀; China) [?]

Specimens Examined: 1♂. INDIA: Tamil Nadu: Chidambaram, iv.2017, Student coll. (1♂) [AUC, Chidambaram]

Remarks: This species is peregrine (widespread) in S. & SE. Asia, Australia (Queensland), Hawaii, Marianas, Micronesia and is familiar in most of the Indian sub-continent. Cherian (1934: 698) mentioned specimens from Coimbatore in Tamil Nadu and was stated to be very common all over India (Joseph & Parui, 1986). Ghorpade et al. (2011: 81) listed it as widespread in India, and as peregrine and widespread in India. It was mentioned as "entire SE. Asia" in the Oriental Catalog (Knutson et al., 1975: 347). For this and other species documented below almost full synonymy is available in Ghorpadé (2015). Specimens may be mistaken for *obliquus* (Wiedemann) but that species has the hind femora black, unlike *arvorum* which has it yellow or orange-yellow.

2. *Eristalinus megacephalus* (Rossi, 1794)

Syrphus megacephalus Rossi, 1794, Mantissa Insectorum, 2: 63 (♂: lost; 'Etruria' = Toscana, Italy) [lost]

Specimens Examined: 3♀. INDIA: Tamil Nadu: Chidambaram, iv.2017, Student coll. (1♀); same locality, no date, Manickavasagam (2♀) [AU, Chidambaram]

Remarks: This species is named as *obscuritarsis* in most Indian/Oriental older literature but should be called *megacephalus* now (vide F. C. Thompson pers. comm..). This synonymy needs to be confirmed since it has a widespread range, from Africa through the Indian sub-continent via China, Taiwan, Java and the Pacific island of Guam. Cherian (1934: 699) recorded it from Kurnool (Andhra Pradesh). Datta & Chakraborti (1986: 58, Fig, 1, A-C) reported it from Kashmir to Bangalore, and in Bangladesh. For complete data see Ghorpadé (2015: 29-30). It is also familiar in most of the Indian sub-continent, especially in the north; southern Indian records are few. Specimens have an elongate-conical abdomen and black tarsi, which are at most pale at base.

3. *Mesembrius bengalensis* (Wiedemann, 1819)

Eristalis bengalensis Wiedemann, 1819, Zool. Mag. (Wied.), 1:16 (♂ ♀: 'Bengal, India' [NM, Wien]

Specimens Examined: 4♂ 2♀. INDIA: Tamil Nadu: Chidambaram, iv.2017, Student coll. (1♂ ♀); same locality, no date, Manickavasagam (3♂ 1♀) [AU, Chidambaram]

Remarks: For complete data see Ghorpadé (2015: 34), Ghorpadé et al. (2011: 82) and Datta & Chakraborti (1986: 60, Fig. 3A-C). It is also familiar in most of the Indian subcontinent, especially in the north, from Bengal. Specimens of males have a tooth below near base of middle femur and fourth tergum has a widely open inverted V-mark.

4. *Mesembrius quadrivittatus* (Wiedemann, 1819)

Eristalis quadrivittatus Wiedemann, 1819, Zool. Mag. (Wied.), 1:17 (♂: 'Bengal') [NM, Wien]

Specimens Examined: 2♂ 2♀. INDIA: Tamil Nadu: Chidambaram, ii & iv.2017, Student coll. (2♂ 2♀).[AU, Chidambaram]

Remarks: For complete data see Ghorpadé (2015: 34-35), Ghorpadé et al. (2011: 82) and Ghorpade (2014a: 10). It is also familiar in most of the Indian sub-continent, especially in the north. In specimens of males eyes just approach but at no point actually touch., they do not have a tooth below near base of middle femur.

5. *Phytomia argyrocephala* (Macquart, 1842)

Eristalis argyrocephala Macquart, 1842, Dipt. exot., 2(2): 45 (105) (♂ ♀: 'Indes Orientales') [?]

Specimens Examined: 1♀. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (1♂). [AU, Chidambaram]

Remarks: For complete data see Ghorpadé (2015: 36) and Cherian (1934: 699) from where latter recorded from Coimbatore. It is also familiar in most of the Indian subcontinent, being dominantly tropical in distribution, and from Coimbatore (Ghorpadé, et al. 2011: 82). Large and stocky eristalines with black hind femur.

Tribe MERODONTINI

6. *Eumerus aurifrons* (Wiedemann, 1824)

Pipiza aurifrons Wiedemann, 1824 Analecta Ent., p. 32 (♂: 'Ostindien') [UZMC, Copenhagen]

Specimens Examined: 1♂. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (1♂). [AU, Chidambaram]

Remarks: For complete data see Ghorpadé (2015: 40). This is a peregrine species of *Eumerus*, distinct in its golden body colour and hairing. It is also familiar in most of the Indian sub-continent.

Subfamily SYRPHINAE
Tribe MELANOSTOMINI

7. *Melanostoma univittatum* (Wiedemann, 1824)

Syrphus univittatus Wiedemann, 1824 Analecta Ent., p. 36 (sex ? 'Ind. Or.') [UZMC, Copenhagen]

Specimens Examined: 20 ♂. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (11♂). ; Student coll. same locality, -.iv.2017 (9♀) [AU, Chidambaram].

Remarks: For complete data see Ghorpadé (2015: 69) and Ghorpade et al. (2011: 80). This is again a peregrine species of *Melanostoma*, distinct in its lack of a facial tubercle. It is also familiar in most of the Indian sub-continent, especially at lower elevations.

Tribe SYRPHINI

8. *Allobaccha triangulifera* (Austen, 1893)

Baccha triangulifera Austen, 1893, Proc. zool. Soc. Lond., p. 138 (♂♀; 'Huldamulla, Ceylon') [BMNH, London]

Specimens Examined: ♂ ♀. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (♂ ♀). [AU, Chidambaram].

Remarks: For data see Brunetti (1923: 124-126), and Cherian (1934: 698), the latter from South Canara. This is a peculiar "*Baccha*" which perhaps needs a new genus (*teste* Thompson, *in litt.*). Brunetti (1923: 124-126) lumped this southern Indian species with his "*Baccha elegans*" which I (Ghorpadé, 1994: 7) separated into two distinct species, *elegans* being a NE. Indian species. Its larvae have been reared on fulgorids.

9. *Asarkina hema* Ghorpadé, 1994

Asarkina hema Ghorpadé, 1994, Colemania,3: 8 (♂; 'Bannerghatta Park') [USNM, Washington, DC].

Specimens Examined: ♂. INDIA: Tamil Nadu: Ootacamund, 17.ii.2016, Manickavasagam (♂). [AU, Chidambaram].

Remarks: For data see Ghorpade (1994: 8). This is a new species discovered by me during a revision of Indian Syrphini. It was seen at Bannerghatta Park, near Bangalore (Karnataka), and at Walayar forest and Thekkady in Kerala. This specimen seen from Ootacamund on the Nilgiri Hills is the first record of this species from Tamil Nadu and is an important first record.

10. *Asarkina incisuralis* (Macquart, 1855)

Syrphus incisuralis Macquart, 1855, Dipt. exot. Suppl., 5: 94 (114) (♂; 'Inde') [OUM, Oxford].

Specimens Examined: 6♂ 1♀. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (4♂); Student coll. same locality, - iv.2017 (2 ♂); same locality, -ii/2017 (♀). [AU, Chidambaram].

Remarks: For data see Ghorpadé (1994: 8; 2014a: 18; 2015: 90-91), Ghorpadé et al. (2011: 80) and Datta & Chakraborti (1986: 53). This was long misidentifed as "*Asarcina ericetorum* or *A. salviae*" in literature (Cherian, 1934: 698), even up to as late as Thompson et al. (2017) without examination of the Fabrician types, which I did (see Ghorpadé, 2015: 91) and Ghorpade (1994: 8). This is again a peregrine species of *Asarkina* distinct in its carinate face (tubercle). It is also familiar in most of the Indian sub-continent, especially at lower elevations.

11. *Serratoparagus yerburiensis* (Stuckenberg, 1954)

Paragus (Paragus) yerburiensis Stuckenberg, 1954, Trans. R. ent. Soc. Lond., 105: 415 (♂; 'Velverry, Ceylon') [BMNH, London].

Specimens Examined: 2 ♀. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (2 ♀). [AU, Chidambaram].

Remarks: For complete data see Ghorpade et al. (2011: 79-80) and Ghorpadé (2015: 82). This is again a peregrine species of *Serratoparagus* distinct in its predominantly black coloration with the first tergum entirely black behind the first transverse ridge. I listed its aphid prey (Ghorpade, 1981: 65) including six new aphid prey species records. We (Thompson & Ghorpadé, 1992: 16-17) documented more than 350 specimens ranging from Delhi across Uttar Pradesh, Bihar, West Bengal, Nepal, and Assam down south to Kerala and Sri Lanka (Map 7).

12. *Dideopsis aegrota* (Fabricius, 1805)

Eristalis aegrotus Fabricius, 1805, Syst, Antlat., 243 (♀; 'China') [ZMC, Copenhagen - examined]

Specimens Examined: 1♀. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (♀). [AU, Chidambaram].

Remarks: For complete data see Ghorpadé (2015: 103). This is again a peregrine species, distinct in its black banded wing and abdominal markings. I listed its aphid prey (Ghorpade, 1981: 70-71).

13. *Episyrphus viridaureus* (Wiedemann, 1824)

Syrphus viridaureus (Wiedemann, 1824), Analecta Ent., p.35 (♂; 'Java') [ZMC, Copenhagen – examined]

Specimens Examined: 1 ♀. INDIA: Tamil Nadu: Chidambaram, no date, Manickavasagam (1 ♀). [AU, Chidambaram].

Remarks: For complete data see Ghorpadé (2015: 108), and Ghorpadé (1994: 10). This is again a peregrine species of *Episyrphus* distinct in its coloration of sterna. I listed its aphid prey (Ghorpade, 1981: 65) including six new aphid prey species records. It was recorded as a predator of "*Syrphus*

balteatus" on *Myzus persicae* on cabbage in Bangalore in June and in Coimabatore on aphids on *Arundo donax* and certain grasses, and extremely common (Datta & Chakraborti (1986).

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India has most Oral Cancer cases

India has the dubious distinction of maximum number of Oral Cancer cases in the world, with about nine lakh people succumbing to diseases caused by tobacco, Balu David, Director Aringar Anna Memorial Cancer Institute said.

The habit of chewing tobacco in the form of gutkha and khaini in the northern states of UP and Bihar, particularly Mainpuri region, is mainly responsible for the disease in the people.

Diversity of Mites occurring on tropical fruit trees in South 24 Parganas District of West Bengal with their economic importance

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Introduction

The South 24 Parganas district of West Bengal is very rich with cultivation of a good number of tropical fruit trees and from there supplies of fruits are made to the rest of the state. The fruit trees commonly available there are mango, litchi, guava, sapota, banana, fig, date palm, wood apple, jackfruit, citrus, coconut, papaya, black berry, wax apple, etc. These trees are attacked by a number of mites, some of which are phytophagous and some are predatory in nature. So far, no concerted efforts were made to survey and document those.

The present study was undertaken to fulfil that gap and the results thereof are presented in this paper. Earlier to this study some stray occurrence of mites have been reported in various works and all those have been included in Gupta (2012).

Material and methods

Survey and documentation: Different collection sites in South 24 Parganas district which were selected were Narendrapur, Baruipur, Canning, Diamond Harbour, Lakshmikantapur, Jharkhali, Gosaba, Namkhana, etc. The period of collection was from August, 2017 to March, 2018 and frequency of collection was at monthly interval.

Collection method:This was done by directly examining the leaves in the field with 20X lens and collecting the mites with a fine brush, moistened with ethyl alcohol. Besides, the infested leaves were also brought to the laboratories, examined those under stereobinocular microscope and collecting those mites.

Preservation and mounting: Preservation was done in 70% alcohol and mounting was done in Hoyer's medium.

The identification was done taking the help of up-dated literature.

Results and Discussion

The identification of collected mite specimens revealed the occurrence of a total of 29 species belonging to 21 genera, 10 families and 3 orders (Table 1). Among these, there were 14 species under 11 genera and 4 families which belonged to the phytophagous group while there were another 12 species under 6 genera and 3 families which were predatory in nature. Apart from these, there were 3 species under 3 genera and 3 families which were fungivorous and occurred on leaves having fungal infection.

Phytophagous group

Among the phytophagous mites, the species which were most dominant and injurious were *Eotetranychus hirsti* on fig, *Eutetranychus orientalis, Schizotetranychus hindustanicus* and *Brevipalpus californicus*, all on citrus while *Tetranychus urticae* and *Aceria litchii*, both on litchi. Out of these dominating species, *Aceria litchii* caused formation of brownish erineum on the undersurface of litchi leaves. The infestation of *Schizotetranychus hindustanicus* produced brownish patches on leaf lamina followed by drying and defoliation. The Tenupalpid mite, *Raoiella indica* on date palm and *Brevipalpus californicus* on citrus produced reddish and brownish patches, respectively on leaves. All the others though occurred but caused no noticeable damage on their respective host plants.

Predatory group

Among the predatory mites, the most dominant species were *Cunaxa setirostris* associated with *Brevipalpus californicus* on guava, *Amblyseius largoensis* on date palm feeding upon *Raoiella indica, Amblyseius guajavae* on guava feeding upon *Brevipalpus californicus* on citrus and *Euseius ovalis* on banana feeding upon *Oligonychus indicus*. Out of these predatory mites, *Amblyseius largoensis, Euseius ovalis, Cunaxa setirostris* appeared to be promising predators.

Fungiferous group

As regards fungiferous mites, 3 species could be collected of which 2 belonged to Oribatida and 1 belonged to Acaridae. Both the species of Oribatids were found on mango and the Acarid mite was collected from wax apple. All these 3 species were found in association with the mould grown on the undersurface of leaves but had no major economic importance.

Table 1. List of mite species collected from tropical fruit trees in South 24 Parganas district of West Bengal, during September, 2017 to June, 2018.

Order/ Family	Species	Host/ Habitat	Locality	Relative abundance	Remarks
		PHYTOPHAGOUS GROUP			
Order: Trombidiformes					
Sub-order: Prostigmata					
Family: Tetranychidae					
1.	*Eotetranychus indicus* Gupta & Gupta	Fig	Narendrapur	3	Occasionally encountered, no damage done.
2.	*Eotetranychus hirsti* Pritchard & Baker	Fig	Narendrapur	1	Produced transparent spots on the undersurface of leaves.
3.	*Eutetranychus orientalis* (Klein)	Citrus	Baruipur	1	Occurred on upper surface, covered the entire leaf with web where the dust particles adhered, the leaf turned brownish, gradually defoliated.
4.	*Oligonychus mangiferus* (Rahman & Sapra)	Litchi, mango	Narendrapur	1	Occur on upper surface, produced first yellowish then brownish spots.
5.	*Oligonychus indicus* (Hirst)	Banana	Baruipur	3	Colonized on undersurface of leaves, produced white spots.
6.	*Schizotertanychus hindustanicus* (Hirst)	Citrus	Canning	1	Yellowish and brownish scattered spots appear all along the leaf lamina, gradually weathered.
7.	*Tetranychus urticae* Koch	Litchi	Narendrapur	1	Occasionally encountered.
8.	*Panonychus citri* (McGregor)	Citrus, papaya	Jharkhali	1	Occurred on both the surface of leaves, along veins, produced brownish patches.
Family: Tenuipalpidae					
9.	*Brevipalpus californicus* (Banks)	Citrus, guava	Namkhana	1	Occurred on undersurface, mostly near mid-vein, produced brownish patches.
10.	*Raoiella indica* Hirst	Date palm	Namkhana	1	Colonized on the undersurface of leaves, produced reddish patches.
Family: Tarsonemidae					
11.	*Polyphagotarsonemus latus* (Banks)	Citrus	Canning	1	Occurred on undersurface, produced yellowish spots.
12.	*Tarsonomus* sp.	Wood apple	Gosaba	3	Occasionally encountered, no damage.
Family: Eriophyidae					
13.	*Aceria ficus* (Cotte)	Fig	Diamond Harbour	3	On undersurface of leaves, produced yellowish patches.

14.	*Aceria litchi* (Keifer)	Litchi	Canning	1	Occurred on undersurface of leaves, produced chocolatey brown erineum, such leaves gradually twisted and dried.
		PREDATORY GROUP			
Family: Cunaxidae					
15.	*Cunaxa setirostris* (Hermann)	Guava	Diamond Harbour	1	Occurred on undersurface of leaves in the corners of the veins, feeding upon *Brevipalpus californicus* on citrus.
16.	*Dactyloscirus* sp.	Coco-nut, Black berry	Gosaba	3	Occasionally occurred.
Order: Mesostigmata					
Family: Stigmaeidae					
17.	*Agistemus industani* Gonzalez-Rodriguez	Papaya	Lakshmi kantapur	3	Occasionally occurred.
18.	*Agistemus* sp.	Wood apple	Jharkhali	3	Occasionally occurred.
Family: Phytoseiidae					
19.	*Amblyseius largoensis*	Date palm	Narendrapur	1	Rich population, fed upon *Raoiella indica.*
20.	*Amblyseius aerialis* (Muma)	Banana	Canning	3	Occasionally occurred.
21.	*Amblyseius mcmurtryi* Muma	Mango	Lakshmi kantapur	2	Occasionally occurred.
22.	*Amblyseius guajavae* (Gupta)	Guava	Gosaba	1	Occurred regularly, feeding upon *Brevipalpus californicus.*
23.	*Euseius ovalis* (Evans)	Jackfruit	Baruipur	2	Occurred regularly, feeding upon *Oligonychus indicus.*
24.	*Euseius alstoniae* Gupta	Banana	Jharkhali	2	Occasionally occurred.
25.	*Euseius bambusae* (Ghai & Menon)	Guava	Baruipur	2	Occasionally occurred.
26.	*Paraphytoseius orientalis* (Narayanan & Kaur)	Fig	Lakshmi kantapur	1	Occurred in good number, feeding not observed.
		FUNGIVOROUS GROUP			
Sub-order: Oribatida					
Family: Xylobatidae					
27.	*Xylobates seminudus* Hammer	Mango	Diamond Harbour	3	Associated with mould.

Family: Scheloribatidae					
28.	*Scheloribates* sp.	Mango	Gosaba	3	Associated with mould.
Family: Acaridae					
29.	*Tyrophagus putrescentiae* (Schrank)	Wax apple	Jharkhali	2	Accidentally occurred, importance unknown.

Relative abundance index:- 1= Highly abundant; 2= Medium abundant; 3=Least abundant.

Conclusion

This paper reports the occurrence of 29 species under 20 genera, 10 families belonging to 4 orders, of those 14 species under 11 genera and 4 families were phytophagous, 12 species under 6 genera and 3 families were predatory and 3 species under 3 genera and 3 families were fungivorous mites occurring on 14 types of tropical fruit trees in South 24 Parganas district of West Bengal. Their relative abundance, economic importance, host/habitat records and localities have also been included. The important pests and predatory mites have also been highlighted.

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The Death of Death

Dying will be 'optional' within just 27 years and the ageing process will be 'reversible', according to two genetic engineers during the presentation of their new book in Barcelona. José Luis Cordeiro, born in Venezuela to Spanish parents, and Cambridge (UK) mathematician David Wood, founders of the operating system 'Symbian', have just published *The Death of Death* and say immortality is a real and scientific possibility that could come much earlier than originally thought.

Humans will only die in accidents, never of natural causes or illness, by around the year 2045, say Cordeiro and Wood, who say it is 'crucial' that old age starts to be classified as an 'illness' so that publicly-funded research into its 'cure' can extend. Nanotechnology is key, among other new genetic manipulation techniques, the engineers said during the presentation at Barcelona's Equestrian Circle. The process will involve turning 'bad' genes into healthy ones, eliminating dead cells from the body, repairing damaged cells, treatments with stem cells and 'printing' vital organs in 3D.

Cordeiro, who is based at the Massachusetts Institute of Technology (MIT) in the USA, says he has 'chosen not to die' and that in 30 years' time, he will be 'younger than he is today'.

Ageing is the result of DNA 'tails', known as 'telomeres', in chromosomes – of which every cell except red blood and sex cells has 23 pairs – becoming shorter, and reversing ageing involves lengthening the telomeres. Telomeres become damaged and shortened with the passage of time, a process that speeds up in the event of toxins entering the body – smoking, alcohol and air pollution are among elements that reduce the length of telomeres, thus accelerating ageing.

Cordeiro and Wood believe that within 10 years, illnesses such as cancer will be curable, and that major international corporations such as Google will be 'entering the field of medicine' because they are 'beginning to realise that curing ageing is possible'. Microsoft has reportedly already announced the setting up of a cryopreservation centre in which a scientist is researching the possibility of cancer being completely curable within a decade. The engineers explain that, although 'people generally do not know about it', it was discovered in 1951 how cancer cells are immortal: when Henrietta Lacks died from cervical cancer, surgeons removed the tumour and kept it – and it is still 'alive' today.

Immortality will not necessarily mean the planet becomes overcrowded, the scientists say: there is still plenty of room for more people on Earth, and these days, people do not have anywhere near as many children as they did in past decades and centuries; plus, 'it will be possible to live in space by then'. "Japan and the Koreas, if they continue with their current trend of hardly having any children, will become extinct – within two centuries, there'll be no Japanese or Korean people on the planet," Cordeiro says.

"I want Spain to have a place in the world of these technologies and show that we're not mad, it's just that people still don't know about them," Wood concluded. *The Death of Death* will eventually be published in four languages at first – Spanish, English, Portuguese and Korean – and all proceeds from its sales will be ploughed back into the authors' research.

A Current List of the Moths (Lepidoptera) of West Bengal

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(Contd. from vol. 20, no. 2, p. 52)

Family SPHINGIDAE

Subfamily Macroglossinae

908. *Acosmeryx anceus* (Stoll, 178)
909. *Acosmeryx anceus subdentata* Rothschild & Jordan, 1903
910. *Acosmeryx naga* (Moore, 1857)
911. *Acosmeryx omissa* Rothschild & Jordan, 1903
912. *Ampelophaga khasiana* Rothschild, 1895
913. *Ampelophaga rubiginosa* Bremer & Grey, 1853
914. *Ampelophaga thomasi* Cadiou & Kitching, 1998
915. *Cechenena lineosa* (Walker,1856)
916. *Cechenena minor* (Bulter, 1875)
917. *Cephonodes hylas* (Linnaeus, 1771)
918. *Dahira tridens* (Oberthur, 1904)
919. *Daphnis hypothous* (Cramer, 1780)
920. *Daphnis nerii* (Linnaeus, 1758)
921. *Deilephila elpenor* (Linnaeus, 1746)
922. *Deilephila rivularis* (Boisduval, 1875)
923. *Elibia dolichus* (Westwood, 1848)
924. *Eupanacra busiris* busiris (Walker, 1856)
925. *Eupanacra malayana* (Rothschild & Jordan, 1903)
926. *Eupanacra moseri* (Gehlen., 1930)
927. *Eupanacra mydon* (Walker, 1856)
928. *Eupanacra perfecta* (Butler, 1875)
929. *Eurypteryx bhaga* (Moore, [1866])
930. *Gurelca hyas* (Walker, 1856)
931. *Hayesiana triopus* (Westwood, 1847)
932. *Hippotion boerhaviae* (Fabricius, 1775)
933. *Hippotion celerio* (Linnaeus, 1758)
934. *Hippotion velox* (Fabricius, 1793)
935. *Hyles livornica* (Esper, 1780)
936. *Lepchina tridens* Oberthur, 1904
937. *Macroglossum aquila* (Boisduval, 1875)
938. *Macroglossum assimilis* (Swainson, 1821)
939. *Macroglossum belis* (Linnaeus, 1776)
940. *Macroglossum bombylans* (Boisduval, 1875)
941. *Macroglossum glaucoptera* (Butler, 1875)
942. *Macroglossum gyrans* (Walker, 1856)
943. *Macroglossum insipidainsipida* Butler, 1875
944. *Macroglossum pyrrhosticta* (Butler, 1875)
945. *Macroglossum troglodytus* (Boisduval, 1875)
946. *Macroglossum variegatum* Rothschild & Jordan, 1903
947. *Neogurelca hyas* hyas (Walker, 1856)
948. *Nephele didyma* (Fabricius, 1775)
949. *Nephele hespera* (Fabricius, 1775)
950. *Pergesa acteus* (Cramer, 1779)
951. *Rhagastis acuta* (Walker, 1856)
952. *Rhagastis confusa* Rothschild & Jordan, 1903
953. *Rhagastis gloriosa* (Bulter, 1875)
954. *Rhagastis lunata* (Rothschild, 1900)
955. *Rhagastis olivacea* (Moore, 1872)
956. *Rhagastis velata* (Walker, 1866)
957. *Theretra alecto* (Linnaeus, 1758)
958. *Theretra clotho* (Drury, 1773)
959. *Theretra latreillei* (MacLeay, 1827)
960. *Theretra latreillei* lucasii (Walker, 1856)
961. *Theretra lycetus* (Cramer, 1775)
962. *Theretra nessus* (Drury, 1773)
963. *Theretra oldenlandiae* (Fabricius, 1775)
964. *Theretra silhetensis* (Walker, 1856)

Subfamily Smerinthinae

965. *Agnosia orneus* (Westwood, 1848)
966. *Ambulyx liturata* Butler, 1875
967. *Ambulyx maculifera* (Walker, 1866)
968. *Ambulyx matti* (Jordan, 1923)
969. *Ambulyx sericeipennis* Butler, 1875
970. *Ambulyx substrigilis* (Westwood, 1848)
971. *Amplypterus mansoni* (Clark, 1924)
972. *Amplypterus panopus* (Cramer, 1779)
973. *Anambulyx elwesi* (Druce, 1882)
974. *Callambulyx rubricosa* (Walker, 1856)
975. *Clanis bilineata* (Walker, 1866)
976. *Clanis phalaris* (Cramer, 1777)
977. *Craspedortha porphyria* (Butler, 1876)
978. *Cypa decolor* (Walker, 1856)
979. *Leucophlebia lineata* Westwood, 1848
980. *Marumba bengalensis* Hampson, 1912
981. *Marumba cristata* (Bulter, 1875)

982. *Marumba dyras* dyras (Walker, 1856)
983. *Marumba indicus* (Walker, 1856)
984. *Marumba spectabilis* (Butler, 1875)
985. *Parum porphyria* (Bulter, 1876)
986. *Polyptychus dentatus* (Cramer, [1777])
987. *Rhodoprasina floralis* (Bulter,1877)
988. *Sataspes infernalis* (Westwood, 1848)

Subfamily Sphinginae

989. *Acherontia lachesis* (Fabricius, 1798)
990. *Acherontia styx* (Westwood, 1847)
991. *Agrius convolvuli* (Linnaeus, 1758)
992. *Apocalypsis velox* Bulter, 1877
993. *Megacorma obliqua* (Walker, 1856)
994. *Meganoton analis* (Felder, 1874)
995. *Psilogramma menephron* (Cramer, [1780])

Family SYMMOCIDAE

996. *Indiospastus epenthetica* (Meyrick, 1931)

Family THYRIDIDAE

Subfamily Siculodinae

997. *Hypolamprus striatalis* (Swinhoe, 1885)
998. *Microbelia intimalis* Moore, [1888]
999. *Rhodoneura emblicalis* Moore, 1888

Family TINEIDAE

Subfamily Hapsiferinae

1000. *Rhinophyllis dasychiras* Meyrick, 1936

Subfamily Meessiinae

1001. *Oxylychna euryzona* Meyrick, 1920

Subfamily Myrmecozelinae

1002. *Latypica albofasciella* (Stainton, 1859)

Subfamily Nemapogoninae

1003. *Hyladaula perniciosa* Meyrick, 1926

Subfamily Teichobiinae

1004. *Dinochora clytozona* Meyrick, 1924

Subfamily Tineinae

1005. *Crypsithyris liaropa* Meyrick, 1924
1006. *Tinea immolata* Meyrick, 1931

Family TORTRICIDAE

Subfamily Olethreutinae

1007. *Aterpia mensifera* (Meyrick, 1916)
1008. *Cryptophlebia encarpa* (Meyrick, 1920)
1009. *Loboschiza* sp.
1010. *Phaecasiophora pertexta* (Meyrick, 1920)
1011. *Sorolopha camarotis* (Meyrick, 1936)

Subfamily Tortricinae

1012. *Archips euryplintha* (Meyrick, 1924)
1013. *Archips hemixantha* (Meyrick, 1918)
1014. *Clepsis humana* (Meyrick, 1912)
1015. *Clepsis melissa* (Meyrick, 1908)
1016. *Cnephasitis dryadarcha* (Meyrick, 1912)
1017. *Electraglaia isozona* (Meyrick, 1918)
1018. *Isodemis illiberalis* (Meyrick, 1918)
1019. *Terthreutis bulligera* Meyrick, 1928

Family URANIDAE

Subfamily Auzeinae

1020. *Decetia pallida* Moore, 1888
1021. *Decetia torridaria* (Moore, 1867)

Subfamily Epipleminae

1022. *Epiplema ruptaria* Moore, 1883

Family ZYGAENIDAE

Subfamily Chalcosiinae

1023. *Agalope basiflava* (Moore, 1879)
1024. *Agalope eroniodes* (Moore, 1879)
1025. *Agalope glacialis* (Moore, 1872)
1026. *Agalope hyalina* (Kollar, 1844)
1027. *Amesia aliris* (Doubleday, 1847)
1028. *Amesia sanguiflua* (Drury, 1773)
1029. *Arbudas bicolor* Moore, 1879
1030. *Cadphises maculata* (Moore, 1865)
1031. *Cadphises moorei* Butler, 1875
1032. *Campylotes atkinsoni* Moore, 1879
1033. *Campylotes histrionicus* Westwood, 1839
1034. *Chalcophaedra zuleika* (Doubleday, 1847)
1035. *Chalcosia pectinicornis* argentata Moore, 1879
1036. *Cyclosia midama* (Herrich-Schäffer, [1853])
1037. *Cyclosia papilionaris* venaria (Fabricius, 1775)
1038. *Erasmia pulchella* Hope, 1840
1039. *Eterusia aedea* (Clerck, 1759)
1040. *Eterusia aedea* edocla (Doubleday, 1847)
1041. *Eterusia lativitta* Moore, 1879
1042. *Eterusia raja* Moore, 1859
1043. *Gynautocera papilionaria* Guérin-Méneville, 1831
1044. *Histia nivosa* Rothschild, 1896
1045. *Milleriana adalifa* (Doubleday, 1847)
1046. *Philopator basimaculata* Moore, 1866
1047. *Phlebohecta fuscescens* (Moore, 1879)
1048. *Pidorus glaucopis* (Drury, 1773)
1049. *Pidorus miles* (Butler, 1881)
1050. *Soritia pulchella* (Kollar, 1844)
1051. *Soritia shahama* (Moore, 1865)
1052. *Trypanophora semihyalina* Kollar, [1844]

Subfamily Procridinae

1053. *Arachotia flaviplaga* Moore, 1879
1054. *Balataea postvitta* (Moore, 1879)
1055. *Clelea discriminis* Swinhoe, 1891
1056. *Inope fuliginosa* (Moore,1879)
1057. *Lophosoma quadricolor* (Walker, 1856)
1058. *Thyrassia subcordata* (Walker, 1854)

Summary

The present work is based on published information which comprise a list of 1058 species belonging to 36 families of moths from West Bengal. The family Geometridae contains maximum number 342 species belonging to 184 genera under 6 subfamilies. Overall, at present the number of species and families has been raised from earlier record of 710 species under 16 families by Sanyal et al. (2012).

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(Concluded).

Research Note

ON SOME INSECTS ASSOCIATED WITH *ALBIZIA LEBBECK* TREE AT SOLAPUR, MAHARASHTRA

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Survey and observations were made on the insects associated with a plant, *Albizia lebbeck* on the campus of the Walchand College of Arts and Science (17.8 N, 75.92 E) at Solapur (Maharashtra), from January to March 2018. The survey was carried out during morning and evening hours.

A total of six insect species were recorded during this short span of study. The list of recorded insect fauna is as follows:

1. Cow bug (*Oxyrachis* sp.)
2. Ant [unidentified]
3. Semilooper [unidentified]
4. Weevil (*Mylocerus* sp.)
5. Long horned beetle (*Aeolesthes holosericea*)
6. Moth *Inderbella* sp.

The caterpillar of *Inderbella* sp. is known as a serious pest of more than 30 crops. The larva bores into the trunk or branches of about 15 to 25 cm deep. The tunnel created is empty in the day time, is filled with caterpillar during the night. It damages the bark of the tree resulting in the dieback of the stem. Frass is visible in the effected areas.

Mamalayya et al., (2009) studied incidence of a beetle *Aeolesthes holosericea* on *Samanea saman* and *Albizia lebbeck* trees at Kolhapur, Maharashtra.

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Mamalayya, A. B., Aland, S. R., Gaikwad, S. M. & Bhawane, G. P. 2009. Incidence of a beetle *Aeolesthes holosericea* on *Samanea saman* and *Albizia lebbeck* trees at Kolhapur, Maharashtra. *Bionotes*, 11 (4):133.

Camel Milk

Foreign Demand Spurs Prices

UK supermarkets stock it; the US has camel milk farms in some states, even the Netherlands has one, and e-tailers source it in powder form from as far away as India. It might be a fad, but the foreign demand for camel milk has spurred prices and brought smiles to camel herders in Rajasthan and Gujarat. A pack of five 20g sachets of camel milk powder is listed for $21 (Rs 1,440) on Amazon.com. Manufacturing units in Bikaner, Kutch and Surat claim to spend Rs 400 per litre to process the milk. As the price is high, retail packs are small even in India. While milk is sold in 200ml cartons, the powder is available in 200g and 500g packs.

Although the milk is not popular outside camel-rearing communities in India, demand has soared because of its claimed health benefits. Remember Virmaram Jat from Barmer? When he fathered a child at the age of 88, in 2006, he credited his virility to a daily diet of camel milk. A year later, 90-year-old Nanuram Jogi, also from Rajasthan, broke his record and confessed he was partial to camel milk, too.

The milk is low in fat, contains five times the vitamin C and 10 times as much iron as cow milk, and does not cause allergies. It is also said to benefit people with diabetes, joint pain and some other diseases. Director of the Bikaner-based National Research Centre on Camel, said, "Recent research has shown positive results of this milk on those suffering from autism, diabetes and stunted growth. Advanced research is underway."

Rajasthan made the Camel as its state animal in 2014, had led to restrictions on its slaughter. Widespread smuggling to Bangladesh has also reduced.

Combining Ability Studies to Realize Maximum Heterosis for Morpho-Economic Traits in the Rapeseed, *Brassica napus* (L.)

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Abstract

The nature and magnitude of combining ability effects were stududied for seed yield, its components and oil content in Rapeseed (*Brassica napus*). Analysis of variance for combining ability revealed that mean squares due to gca and sca were significant for all the characters. This indicates that both additive and non additive gene effects were important in the expression of these characters. The mean degree of dominance (2sca/ 2gca) was quite high for seed yield per plant, plant height, number of siliquae on main raceme and primary branch, indicating the involment of non-additive gene effects in controlling the inheritance of these traits. The lines GSC-3A and CSM-25 were the best general combiner as judged by its consistent desirable gca effects over the F1S and F2S for six characters, namely, plant height, main raceme length, primary branches, secondary branches, number of siliquae on main raceme and seed yield per plant. The female, CAN-105, showing high gca effects for secondary branches, siliquae on main raceme, harvest index, seed yield per plant and oil content also showed high per se performance. The cross GSC-3A Sheetal and GSC-861-212 WBN-1 showed significantly high heterosis for seed yield and some of the yield contributing traits. The cross TKG-24 Neelam, BCN-25 Sheetal, CAN-101 WBN-1 and GSC-861-212 WBN-1 also exhibited high and significant heterosis for oil content per cent. As both additive and non-additive gene effects are present, breeding strategies that exploit both types of gene action such as biparental mating approach and reciprocal selections should be followed for the genetic improvement of seed yield and other traits and this will also give further opportunity for substantial release of hidden genetic variability.

Introduction

Oilseed crops and rapeseed-mustard account for 14% and 3% respectively of the gross area in India. Among the oil seed crops, rapeseed-mustard is next to groundnut, and currently it contributes nearly 22.2% and 24.2% of the oilseeds acreage and production, respectively (Kumar, 2005). *Brassica napus*, a rapeseed is grown in U.P., as well as in other states of the country during rabi season. *Brassica napus* species is grown as a pure or a mixed crop system. But its low productivity is a major constraint in its large-scale cultivation in U.P.

Development of high yielding varieties can contribute significantly to increase productivity as well as production. Suitable breeding methodology and identification of superior parents are the pre-requisite for the development of high yielding genotypes. Sound understanding of gene effects involved in the expression of various yield attributes is of prime importance in formulating any breeding methodology. The knowledge of combining ability effects and their resulting variances are of paramount significance in deciding the selection procedure for exploiting either heterosis or obtaining new recombinants of desirable types in any crop. This possibility was explored in the present study and combining ability of desirable lines was investigated.

Materials and methods

15 lines viz., NDR-10, GSC-3A, CAN-101, RTM-365, RKN-9806, GSL-1, NUDB-38, GSC-861-212, PRM-101, HNS-003, CAN-105, BCN-25, CSM-25, TKG-24, TERI (00) R-985 and three testers namely Sheetal, Neelam and WBN-1 representing wide range of diversity were selected for the study. Experimental material consisted of 15 lines and 3 testers, which were officially received from DRMR, Sewar, Bharatpur (Rajasthan) in September, 2010 and also selected from different geographic regions considering its pedigree record. 45 possible cross combination were made during experiment I following line tester mating design of Kempthorne (1957). The parent and all F_1's were grown in RBD with three replications during rabi season 2012-2013 and 2013-2014 as experiment II and experiment III at Agricultural Research Farm, Narain College, Shikohabad. The resulting 15 lines and 3 testers were raised in a randomized block design with a single row of 3 meters in three replications. The row to row distance was kept at 40 cm and plant to plant at 15 cm. The observations were recorded on ten characters viz; plant height, main raceme length, no. of primary branches, no. of secondary branches, harvest index,

1000-seed weight, oil content, and seed yield per plant.

Results and Discussion

The analysis of variance for combining ability revealed significant differences for all the characters studied in case of fifteen lines, which indicated the existence of genetic diversity in the parental materials. On the other hand, among testers highly significant differences were observed for plant height, main raceme length, number of primary and secondary branches. The mean sum of squares and appropriate degree of freedom are given in Table 1. The mean sum of squares due to females were found to be smaller than those due to males except for Sq/MR, Sq/L, TW and OC. Variations among line tester interaction were significant for all the characters. This indicated the manifestation of parental genetic variability in their crosses and presence of uniformity among the hybrids.

The significance of mean squares due to lines (females) and testers (male) indicated prevalence of additive variance for all the characters, except Sq/L and TW. The significance of mean squares due to line tester for all the characters provide a direct test indicating that non-additive variance was important for exposition of the characters.

General combining ability estimates of parents are presented in Table 2. The result revealed that parents GSC-3A and CSM-25 were the best general combiner as judged by its consistent desirable gca effects over the F_1S and F_2S for six characters, namely, plant height, main raceme length, primary branch, secondary branches, number of siliquae on main raceme and seed yield per plant. The female CAN-105 showing high gca effects for secondary branches, siliquae on main raceme, harvest index seed yield per plant and oil content also showed high per se performance. Ghosh et al. (2002) has also reported that CAN-105 was a good general combiner for all the characters studied by them. Among the other lines, TERI(00) R-985 for plant height, main raceme length, siliqua length and oil content, GSL-1 for plant height, primary branches and secondary branches, NDR-10 for main raceme length and primary branches, RKN-9806 for primary branches and oil content, RTM-365 for main raceme length, were the best lines as revealed by their per se performance and gca effects. Among the testers, Sheetal was the best general combiner as proved by its consistent significant favourable gca effects over the F_1s for six characters, viz; plant height, primary branches, secondary branches, number of siliquae on main raceme, siliqua length and seed yield per plant. The tester, Neelam, exhibiting high gca effects for plant height, main raceme length, secondary branches and length of siliqua also expressed high per se performance. WBN-1 was another male parent which exhibited high gca effects for plant height, 1000-seed weight and oil content along with better per se performance (Table 3).

The estimates of specific combining ability effects for most of the characters were lower in magnitude than gca. In most of the cases, the best F_1, l t hybrid combinations selected on the basis of per se performance recorvered high Sca effects except plant height, harvest index and test weight. Similar results were reported by Anand & Rawat (1984), Sheikh & Singh (1998), Gosh et al. (2002) and Sridhar & Raut (2003) and Tripathi et al. (2005) In most of the 16 crosses, which exhibited desirable significant sca effects, one good and one poor or average general combiners were involved except GSC-3A WBN-1 (Poor Poor) for main raceme length, NDR-10 Sheetal (Poor Poor) for number of siliquae on main raceme, CSM-25 WBN-1 (Poor Poor) of length of siliqua and RKN-9806 Neelam (Poor Poor) for test weight. Similar observation of Poor Poor combinations of gca effects in Indian mustard have been reported by Singh et al. (1973), Krishna & Ghosh (1992) observed that poor combining parents locked the additive effects of good inbred, but were highly resposible to heterozygosis in the way of non-additive effects. Katiyar et al. (2000) reported that additive and non additive gene effects were also equally important in the inheritance of siliquae on main shoot, seed yield per plant and oil content.

Two of the three best combinations in general included one good general combiner and one poor or average general combiner in respect of the characters, main raceme length, primary and secondary branches, siliquae number and siliqua length, test weight, oil content and seed yield per plant. However, out of these best combinations viz., NDR-10 Sheetal, for main raceme length, GSL-1 Sheetal for number of primary branches and GSC-3A WBN-1 for seed yield included both the parents with high gca effects. It is, thus, seen that in most of the cases, the high low crosses exhibited greater sca effects, most likely because of the concentration of opposing alleles in the parents which showed high allelic interaction in F_1S. The high performance of the high high crosses may be described to accumulation of favorable alleles in F_1S as well as beneficial interaction effects such crosses are ideally suitable for exploitation either through pedigree selection or recurrent selection.

The results obtained from the present study clearly showed that genetic improvement is possible for seed yield. In order to capitalize on both types of gene action, any method such as l t mating approach that maintains some heterozygosity would be beneficial. It would be more appropriate to follow l t crossing among F_1's each having both types of gene components. The capacity of a parent to transmit gene

Table 1. Pooled analysis of variance of combining ability for line x tester analysis in *Brassica napus* L.

	Source of variance	d.f.	Mean squares									
			PH	MRL	PB	SB	Sq/Mr.	Sq/L	HI	SY	TW	OC
1	Replications	2	2.35	14.52	0.25	12.75	273.33	2.67	0.0007	12.32	0.47	9.14
2	Lines	14	832.51	535.46*	4.54*	56.39*	914.88*	14.16*	0.0085*	534.42*	0.42	105.53*
3	Testers	2	2847.16	664.02*	8.14*	132.65*	256.80*	8.27	0.019*	1114.65	0.82	32.52
4	Line x Testers	45	223.42*	112.94*	1.13*	20.48*	315.15*	2.97*	0.003*	82.65*	0.27*	7.86*
5	Error	126	96.76	36.76	0.43	4.65	274.20	0.84	0.0002	23.77	0.23	2.04

* Significant at 5% level.

Table 2. General combining ability effects of lines and testers pooled of two years for 10 characters in *Brassica napus*.

	Lines / Testers	PH	MRL	PB	SB	Sq/MR	Sq/L	HI	SY	TW	OC
	Lines										
1	NDR-10	-3.42	5.25**	0.24**	0.56	-1.31	0.36	0.00	0.17	0.01	0.34
2	GSC-3A	6.63**	2.87**	0.31**	2.56**	5.27**	0.67**	0.00	4.98**	-0.11	-1.08**
3	CAN-101	-0.76	1.50	-0.10	0.52	1.56	-0.20	0.01	5.61**	0.09	0.97**
4	RTM-365	-3.01	4.42**	-0.33**	-0.61	-1.37	-0.73**	0.01	0.95	0.07	0.48
5	RKN-9806	2.03	0.10	0.34**	0.48	0.08	-0.61**	-0.01	0.95	0.14*	0.64*
6	GSL-1	14.68**	3.93	0.53**	1.16**	1.42	0.42	-0.03*	0.85	0.02	-0.54
7	NUDB-38	3.52	0.85	-0.37**	-0.08	2.04	-0.67**	0.04*	0.85	0.01	-0.56
8	GSC-861-212	2.94	0.68	0.11	1.73**	-1.65	0.48**	0.00	2.42*	-0.05	1.51**
9	PRM-101	-3.95*	-0.62	-0.44**	-2.40	-0.35	-0.68**	0.01	1.82	0.06	1.74**
10	HNS-003	3.42	-4.47**	0.11	-1.25	2.06	-0.87**	0.01	5.13**	0.17*	0.40
11	CAN-105	0.65	2.02	0.56**	1.62**	3.46**	0.21	0.04**	4.17**	0.03	0.67*
12	BCN-25	-11.67**	-2.07	-0.12	-0.42	3.65**	-0.75**	0.08**	3.37**	-0.09	1.85**
13	CSM-25	-8.64	-1.12	-0.94**	-3.82	-3.58	-0.73**	-0.03**	-5.76**	-0.13	1.06**
14	TKG-24	-1.02	3.56**	0.11	-0.15	0.75	-0.18	0.00	-0.59	-0.17	1.86**
15	TERI(00) R-985	-2.64	-4.92	0.12	0.23	-3.55	0.55	0.01	3.38**	0.07	0.18
	Testers										
1	Neelam	-6.86**	0.75	-0.45**	-1.37**	1.95	-0.37**	0.02	-0.65	0.01	0.25
2	Sheetal	5.03**	-0.92	0.38**	0.56**	-3.55*	-0.45**	-0.03*	-1.67**	0.17**	1.00**
3	WBN-1	-4.96**	3.16**	-0.10	0.12	1.15	0.35**	0.01	1.35**	-0.05	0.43**

* Significant at 5% and **Significant at 1% level.

Table 3. Superior general combiners for 10 characters in *Brassica napus*.

	Characters	Lines	Testers
1	Plant height (PH) (Dwarfness)	BCN-25, CSM-25, PRM-101, NDR-10, RTM-365	Neelam, WBN-1
2	Main raceme length (MRL)	NDR-10, RTM-365, GSL-1, TKG-24, GSC-3A	WBN-1
3	Number of primary branches (PB)	CAN-105, GSL-1, RKN-9806, GSC-3A, NDR-10	Sheetal
4	Number of secondary branches (SB)	GSC-3A, GSC-861-212, CAN-105, GSL-1, BCN-25	WBN-1
5	Number of siliquae on main raceme (Sq/MR)	GSC-3A, BCN-25, CAN-105	Neelam
6	Length of siliqua (Sq/L)	GSC-3A	WBN-1
7	Harvest index (HI)	BCN-25, NUDB-28, CAN-105	Neelam
8	1000-seed weight (Test weight, TW)	HNS-003, CSM-25	Sheetal
9	Seed yield per plant (SY)	CAN-101, HNS-003, GSC-3A, BCN-25, CAN-105, TERI(00) R-985, GSC-861-212	WBN-1
10	Oil content (%) (OC)	TKG-24,BCN-25,PRM-101, TERI(00) R-985, GSC-861-212,CAN-101	Sheetal, WBN-1

complex for traits to its progeny is known from the status of its gca effects. A variety may be good. poor or an average combiner for a given trait and when all the traits are considered, a variety will be combination of different levels of combining ability effects.

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Gujarat Donkeys

Blood samples have been drawn from 70 donkeys each from Kutch and Jamnagar region. The donkeys are being genetically profiled and may soon stake claim as a separate breed! Gujarat's Banni buffalo, Kathiawari horse and Kharai camel have already been granted independent-breed status by the National Bureau of Animal Genetic Resources (NBAGR), authority for registration of new breeds.

Gujarat primarily has two breeds of donkeys — Kutchi and Halari. Kutchi donkeys have smaller frame and darker complexion. They are very sturdy and are used for long journeys and for climbing mountains.

On Some Mites from Stored Products of Grocery Shops in Howrah District, West Bengal

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Introduction

Most of the grocery shops having various types of household commodities become good habitats of various species of mites. Some of those infest cereals, pulses, spices and some other commodities kept in grocery shops, often doing minor to major damage and sometimes make those totally unsuitable for human consumption. Likewise, there are some beneficial mites also which act as predators of those injurious mites and help to keep their population below economic injury level. Also there are some which are fungal feeders and thrive on those grains having fungal infection. Though several workers reported mites occurring on various types of stored products from West Bengal and all those have been reviewed in Gupta (2012) but no study has ever been undertaken anywhere in India regarding occurrence of mites in the stored product commodities of grocery shops and their economic importance, if any.

Hence, it was thought necessary to conduct a preliminary survey of the mites occurring in stored product commodities of the grocery shops and their economic importance. The present paper includes the result of this study.

Material and methods

Study area- West Bengal, Dist- Howrah (Localities- Bally, Belur. Liluah, Salkia).
Study period- September 2017 to June 2018.
Sampling frequency- Fortnightly.
Sample size- 100gms (both in case of grains or flour).
Collection- By examining the samples under stereobinocular microscope and collecting the mites with brush moistened with alcohol.
Preservation- In 70% alcohol.
Mounting- Mounted in Hoyer's medium.
Identification- It was done by consulting the updated literature. While examining the relative abundance, nature of association and damage done, if any, were also recorded.

Results and Discussion

The identification of collected mite specimens revealed the occurrence of 17 species under 13 genera, 9 families, 3 orders which included 8 species under 5 genera of grain damaging mites, 6 species of 5 genera of predatory mites and 2 and 1 species each of fungal associated and uncertain associated mites. The list of mites along with their location, habi-

Table 1. List of mite species counted from stored products of grocery shops in Howrah district, during September 2017 to June 2018.

Species	Locality	Habitat	Abundance status	Economic status	Nature of association
Order- Astigmata					
Family- Acaridae					
1. *Acarus gracilis* Hughes	Howrah (Bally)	Wheat flour	1	A	Heavy infestation observed on wheat flour giving an pungent odour. This species not earlier reported on this habitat.
2. *Acarus siro* L.	Howrah (Bally)	Cumin seeds, Red gram	2	B	Moderate infestation observed on cumin seeds and red gram pulse. Damage done of moderate nature.
3. *Acarus ferris* (Oudemans)	Howrah (Bally)	Gram flour	2	B	Moderate infestation on gram flour making that clumpy.
4. *Rhizoglyphus* sp.	Howrah (Belur)	Rice	3	C	Occasional occurrence, observed on rotten rice grain making the grains with small holes.

5. *Tyroborus lini* Oudemans	Howrah (Bally)	Rice	3	C	Occurred only occasionally. No noticable damage done.
6. *Tyrophagus putrescentiae* (Schrank)	Howrah (Belur)	Green gram	1	A	Abundantly found on pulse crop causing appearance of holes. It forms new habitat record.
7. *Caloglyphus berlesei* (Michael)	Howrah (Belur)	Wheat whole grain	1	B	This was found in association with a beetle and make the wheat grains with foul odour.
Family- Pyroglyphidae					
8. *Dermatophagoides pteronyssinus* (Trouessast)	Howrah (Bally)	Semolina	3	B	This mite is more common in house dust and its occurrence on semolina appears to be accidental through contamination.
Family- Glycyphagidae					
9. *Glycyphagus destructor* (Schrank)	Howrah (Liluah)	Wheat flour	2	B	A moderate infestation noticed on wheat flour in association with *Acarus gracilis*.
Order- Prostigmata					
Family- Cheyletidae					
10. *Cheyletus malaccensis* Oudemans	Howrah (Belur)	Semolina	1	A	Observed abundantly on semolina attacking *Dermatophagoides pteronyssinus*.
11. *Cheyletus aversor* Rohdendorf	Howrah (Bally)	Green gram, Split gram	3	C	Occasional occurrence. Importance not known.
12. *Cheyletus eruditus* (Schrank)	Howrah (Liluah)	Red gram, cumin	2	C	Often encountered in association with *Acarus siro* feeding not observed.
Family- Tarsonemidae					
13. *Tarsonemus* sp.	Howrah (Salkia)	Gram flour, semolina, wheat flour	3	C	Occasionally encountered, in association with wheat flour having fungal contamination.
Order- Mesostigmata					
Family- Phytoseiidae					
14. *Neoseiulus* sp.	Howrah (Salkia)	Wheat whole grain, flour	2	A	Predatory mite observed feeding upon *Caloglyphus*.
Family- Uroporidae					
15. *Fuscuropoda marginata* (C.L.Koch)	Howrah (Bally)	Bengal split gram, Split red lentil	2	B	Fungal associated mite.
Family- Parasitidae					
16. *Parasitus cansanguinus* Oudemans	Howrah (Liluah)	Broken rice, Wheat whole grain	1	A	It is infact a predatory mite but its occurrence in the present study was not found to be associated with any prey mite.

Family- Laelapidae					
17. *Androlaelaps casalis* (Berlese)	Howrah (Bally)	Rice, Gram flour, Wheat flour	3	B	It is a predatory mite found in association with *Tyroborus* sp. To which it was attacking.

Abundance : 1 = Most abundant; 2 = Moderately abundant; 3 = Least abundant.
Economic status : A = Most injurious; B = Moderate injurious; C = Less injurious.

tat, relative abundance, economic importance status and nature of association etc. have all been given in Table1 which is self explanatory.

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Conclusion

This paper reports the occurance of 17 species of mites under 13 genera, 9 families, 3 orders which include 8 species under 5 genera of grain damaging mites, 6 species under 5 genera of predatory mites, 2 and 1 species each of fungal associated and uncertain associated respectively. *Acarus gracilis* and *Tyrophagus putrescentiae* were found most damaging types on wheat flour and pulses, respectively, while *Cheyletus malaccensis* was the most dominating predator.

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Is Ganga on the Verge of Drying?

JAYASHREE NANDI

A new study has set off alarm bells on the health and flow of river Ganga. It has found that the summer water flow in the river is severely depleted, so much so that there may be hardly any flow in the non-monsoon months in large stretches of the river from Varanasi to Kolkata in the coming years, the study published in *Nature's Scientific Reports* recently has predicted.

The base-flow (groundwater inflow) into the river may have decreased by 50% from the beginning of irrigation days in the 1970s, mainly a result of indiscriminate extraction of groundwater. In next 30 years the report suggests that groundwater contribution can decrease by up to 75% compared to 1970s in the non-monsoon months.

This also means that pollution levels may rise further as there will hardly be any dilution of the sewage and other pollutants that drain into the river and remain concentrated.

"In the coming decades the river will become non-existent in many stretches. It is a catastrophic scenario but we see it happening if immediate steps are not taken to control groundwater extraction in 2-3 kms zone of the river. This will affect river life and ecology and lives of communities dependent on the river for irrigation, for drinking water, even industries will be impacted," said Abhijit Mukherjee, Associate Professor of Geology and Geophysics at IIT Kharagpur and lead author of the study.

The authors said that there are many reports which have indicated that the river is drying but no quantitative information was available on these trends. Some studies have also suggested that climate change could be impacting flow.

This study, however, used long term satellite data, hydrogical modelling, hydro-geo-chemical and isotope studies to arrive at how much base flow was decreasing and how much groundwater had been extracted. The level of groundwater depletion rate is the range of 0.5 to 38.1 cm/year between the summer of 1999 and 2013, according to the study.

"We looked at 28 locations through satellite data. Around 19 locations showed severe depletion trends. In some areas, the aquifers are drawing river water because there is no groundwater at all. This is called streamflow capture," added Mukherjee. Areas around Varanasi, eastern Bihar and downstream of Farakka barrage in West Bengal are worst affected.

Authors of the report— Mukherjee, Soumendra Nath Bhanja and Yoshihide Wada of International Institute for Applied Systems Analysis (IISA), Austria — also noted in the study that "such streamflow reduction due to intense groundwater pumping is of utmost concern during low flow seasons like pre-monsoon season in Ganga basin ... the depletion in river water volume will also have a profound effect on future food security in Ganga basin— the bread basket of south Asia. The highly productive Indo-Gangetic basin would experience substantial reduction in food production if groundwater continued to be extracted in current unsustainable rate."

An updated list of the Collembola from West Bengal

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The collembolan insects commonly called "spring-tails" are small, entognathous, wingless hexapods possessing a spring-like forked jumping organ and the furcula underneath the fourth abdominal segment. They are minute in size (less than 6 mm in length); antennae primarily with 4 segments. The presence of antennae and absence of cerci distinguish them from other entognathous hexapods. The collembolans have very diverse distribution occurring in all zoo-geographical regions of the world, inhabiting a wide range of ecological niche and climate.

There are about 8800 species of Collembola recorded from the world (Bellinger et al., 2018). Mandal (2018) has published an updated checklist of Collembola from India comprising 342 species under 113 genera belonging to 20 families. Collembola insects of West Bengal were first reported by Imms (1912) from Indian Botanic Garden and Indian Museum Campus, Calcutta. Thereafter, Mukherjee (1932), Choudhuri & Roy (1965), Hazra & Choudhuri (1981), Hazra et al. (2007), Mandal (2011), Mitra (1966, '74) and Mitra et al. (1977) have reported collembola from different ecosystems of West Bengal. Mandal (2011) recorded 16 species of collembola from the Bibhuti Bhushan Wildlife Sanctuary, Parmadan. Mandal & Suman (2013) recorded 9 species of collembola under 8 genera of 5 families from the Sajnekhali Wildlife Sanctuary. Recently, Roy & Mandal (2017) recorded 25 species under 20 genera belonging to 13 families of Collembola from different habitats of the Indian Botanic Garden.

An updated checklist of the Collembola from West Bengal state is provided here with their distribution. A total of 75 species under 43 genera belonging to 13 families have been reported from different districts of West Bengal (Table 1).

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Table 1. List of the Collembolan species recorded from West Bengal, India.

	Species	District	Locality
Family: Neanuridae			
1	*Pseudachorutes anomalus* Imms, 1912	Darjeeling	Kurseong
2	*Lobella (L.) maxillaris* Yosii, 1966	Burdwan,	Golapbag,
		South 24 Pgs,	Sajnekhali Wild Life Sanctuary
		Alipurduar,	Buxa Tiger Reserve
		Jalpaiguri	Gorumara National Park.
3	*Protanura carpenteri* Mukherjee, 1932	Kolkata	Eden Garden
4	*Paleonura siva* (Yosii, 1966) Cassagnau, 1982	Howrah	Indian Botanical Garden
5	*Singalimeria pachyderma* Cassagnau, 1984	Darjeeling	Singalila
6	*Gnatholonche polychaetosa* Cassagnau, 1984	Darjeeling	Tiger Hill
7	*Himalmeria ornata* Cassagnau, 1984	Darjeeling	Tonglu, Northern hillside, Singalila
8	*Himalmeria (Yetimeria) lama* Cassagnau, 1984	Darjeeling	Tiger Hill , Southern Hillside
9	*Himalmeria (Yetimeria) rostrata* Cassagnau, 1984	Darjeeling	Tonglu, Northern hillside, Singalila
10	*Himalmeria (Yetimeria) armata* Cassagnau, 1984	Darjeeling	Tista River Valley, Sukna
11	*Himalmeria (Yetimeria) lanata* Cassagnau, 1984	Darjeeling	Tonglu, Northern hillside Singalila.
12	*Himalmeria (Yetimeria) spatulata* Cassagnau, 1984	Darjeeling	Tonglu, Northern hillside, Singalila.
13	*Paranura squamosa* Cassagnau, 1991	Darjeeling	Singalila.
14	*Parvatinura loebli* Cassagnau, 1984	Darjeeling	Forest between Kalimpong and Algarah, Tista River Valley.
15	*Parvatinura colcheni* Cassagnau, 1984	Darjeeling	Tonglu, Northern hillside, Singalila.
16	*Friesea excelsa* Denis, 1936	Kolkata	Dhapa, E.M.Bypass.
Family: Hypogastruridae			
17	*Ceratophysella indica* (Salmon, 1956)	Howrah	Indian Botanical Garden
18	*Ceratophysella indovaria* (Salmon, 1970)	Howrah	Indian Botanical Garden
19	*Xenylla obscura* Imms, 1912	Kolkata,	Indian Museum Collection,
		North 24 Pgs	Bibhuti Bhusan WLS, Parmadan.
Family: Onychiuridae			
20	*Allonychiurus indicus* (Choudhuri & Roy, 1965)	North 24 Pgs,	Bibhuti Bhusan WLS, Parmadan,
	Pomorski, 2000	Howrah	Indian Botanical Garden
Family: Tullbergidae			
21	*Paratullbergia indica* Salmon, 1965	Howrah	Indian Botanical Garden
Family: Brachystomellidae			
22	*Brachystomella terrafolia* Salmon, 1944	Howrah	Indian Botanical Garden
Family: Isotomidae			
23	*Isotomodes dagamae* Prabhoo, 1971	Kolkata	Dhapa, E.M.Bypass.
24	*Hemisotoma thermophila* (Axelson, 1900)	Kolkata,	Eden Gardens,
	Bagnall, 1949	North 24 Pgs,	Bibhuti Bhusan WLS, Parmadan
25	*Ballistura bengalensis* Yosii, 1966	Howrah,	Indian Botanical Garden,
		North 24 Pgs	Bibhuti Bhusan WLS
26	*Isotomurus balteatus* (Reuter,1876)	Bankura,	Lokpur, Taldangra,
	Handschin, 1929	North 24 Pgs	Barrackpore, Bibhuti Bhusan WLS, Parmadan
27	*Isotomurus palustris* (Muller, 1776) Borner, 1906	North 24 Pgs	Barrackpore
28	*Isotomurus ciliatus* Stach, 1947	Kolkata,	Eden Gardens,
		North 24 Pgs	Barrackpore
29	*Isotomurus jharkhandensis* Mandal,	Darjeeling,	Sukna,
	Suman & Bhattacharya, 2017	Jalpaiguri,	Murty beat, Gorumara NP,
		Alipurduar	Lataguri, Chapramari,

30	*Isotomiella minor* (Schaeffer, 1896) Yosii, 1939	North 24 Pgs, South 24 Pgs	Bibhuti Bhusan WLS, Bankrahat
31	*Axelsonia nitida* (Folsom, 1899) Borner, 1906	South 24 Pgs	Sajnekhali WLS
32	*Folsomides purvulus* Stach, 1922	Kolkata, North 24 Pgs, South 24 Pgs	Eden Gardens, Barrackpore, Bankrahat
Family: Entomobryidae			
33	*Homidia cingula* (Borner, 1906) Yosii, 1959	Darjeeling, Hooghly	Sukna, Bhadreswar, near Victoria jute mill
34	*Sinella curviseta* Brook, 1882	South 24 Pgs	Sajnekhali WLS
35	*Lepidocyrtus exploratorius* Carpenter, 1924	North 24 Pgs	Bibhuti Bhusan WLS
36	*Lepidocyrtus (Lanocyrtus) caeruleicornis* Bonet, 1930	Howrah, South 24 Pgs	Indian Botanical Garden, Sudanyakhali
37	*Lepidocyrtus (Lepidocyrtus) curvicollis* Bourlet, 1841	South 24 Pgs	Sajnekhali WLS, Sudanyakhali
38	*Lepidocyrtus (Acrocyrtus) heterolepis* Yosii,1959	Howrah, North 24 Pgs, South 24 Pgs	Indian Botanical Garden, Barrackpore, Bankrahat
39	*Lepidocyrtus (Acrocyrtus) malayanus* Yosii, 1959	Jalpaiguri, Alipurduar	Lataguri, Kumargram, Buxa; Nilpara, Jaldapara NP
40	*Lepidocyrtus (Cinctocyrtus) medius* Schaeffer, 1898	Bankura, North 24 Pgs	Taldangra, Bibhuti Bhusan WLS
41	*Lepidocyrtus (Ascocyrtus) scaber* Ritter, 1911	Kolkata, North 24 Pgs	Eden Garden, Barrackpore
42	*Lepidocyrtus magnificus* Carpenter, 1924	North 24 Pgs	Bibhuti Bhusan WLS
43	*Dicranocentrus indicus* Bonet, 1930	Kolkata,	Indian Museum Compound.
44	*Dicranocentrus cercifer* (Imms, 1912) Mari Mutt, 1979	Kolkata, South 24 Pgs	Indian Museum Compound, Bankrahat
45	*Alloscopus tetracanthus* (Borner, 1906)	Kolkata, North 24 Pgs	Indian Museum Compound, Barrackpore,
46	*Seira indica* (Ritter, 1911) Yosii, 1966	North 24 Pgs	Bibhuti Bhusan WLS, Barrackpore
47	*Seira indra* (Imms, 1912)	Kolkata,	Indian Museum Compound
48	*Seira lateralis* Yossi, 1966	South 24 Pgs	Bankrahat
49	*Sinella montana* Imms,1912	Hooghly, Howrah	Bandel Station, Gustia
Family: Paronellidae			
50	*Salina bengalensis* Mitra, 1973	Howrah, Kolkata, North 24 Pgs Darjeeling Jalpaiguri, Alipurduar	Indian Botanical Garden, Eden Garden, Barrackpore; Sevok, Mahananda, Lataguri ,Gorumara NP; Kumargram range, Buxa Tiger Res.
51	*Salina celebensis* (Schaeffer, 1898) Yosii, 1959	Kolkata	Eden Garden
52	*Salina indica* (Imms, 1912) Yosii, 1960	Kolkata, Howrah, Jalpaiguri, Darjeeling	Indian Museum Collection, Indian Botanical Garden, Khunia beat, Gorumara NP; Mahananda WLS.
53	*Salina javana* (Handschin, 1928) Yayuk, 1989	Darjeeling	Ghum, Darjeeling
54	*Salina montana* (Imms, 1912)	Darjeeling	Kurseong

55 *Salina striata* (Handschin, 1928)	Kolkata	Eden Garden
56 *Salina yosii* Salmon, 1964	Kolkata	Eden Garden
57 *Callyntrura lineata* (Parona, 1892) Yosii, 1961	Jalpaiguri	Hamiltonganj, Gorumara NP.
58 *Callyntrura vestita* (Handschin,1925) Yosii, 1982	Darjeeling, Jalpaiguri	Lopchu Tea Estate; Daling Coat, Gorubathan; Chapramari Beat, Gorumara NP; North Murty Beat.
59 *Callyntrura zaheri* Mitra, 1974	Darjeeling	Ghum, Darjeeling
60 *Dicranocentroides flavescens* Yosii, 1966	Howrah, Burdwan, Darjeeling, Jalpaiguri, Alipurduar	Indian Botanical Garden, Golpabag, Sukna Military Camp, Batabari Tea Estate, Chalsa; Baikunthapur Forest, Buxa Tiger Reserve
61 *Dicranocentroides gisini* Mitra, 1975	Alipurduar	Rajabhatkhawa, Buxa Tiger Res. Jayanti, Buxa Tiger Res.
62 *Yosiia dehradunia* Mitra, 1967	Burdwan, Alipurduar	Golapbag, Kumargram, Buxa Tiger Res. Nilpara forest, Jaldapara NP.
63 *Cyphoderopsis ceylonica* Yosii, 1966	Howrah	Indian Botanical Garden
64 *Cyphoderus javanus* Borner, 1906	Howrah	Indian Botanical Garden
65 *Cyphoderus albinus* Nicolet, 1842	Kolkata, North 24 Pgs	Eden Gardens, Barrackpore
Family: Neelidae		
66 *Neelus murinus* Folsom, 1896	Kolkata	Eden Gardens
67 *Megalothorax minimus* Willem, 1900	Kolkata	Eden Gardens
Family: Arrhopalitidae		
68 *Pygmarrhopalites habei* (Yosii, 1956)	Howrah	Indian Botanical Garden
Family: Sminthuridae		
69 *Sminthurus parvullus* Ritter, 1911	Howrah	Indian Botanical Garden
70 *Sminthurus viridis* (Linn. 1758) Bourlet, 1843	Howrah	Indian Botanical Garden
71 *Sphyrotheca gangetica* Yosii, 1966	Howrah, North 24 pgs	Indian Botanical Garden, Bibhuti Bhusan WLS, Parmadan
Family: Dicyrtomidae		
72 *Calvatomina pagoda* (Yosii, 1966)	Kolkata	Eden Garden
Family: Sminthurididae		
73 *Sminthurides appendiculatus* Imms, 1912	Kolkata, South 24 Pgs, North 24 Pgs	Eden Gardens, Barrackpore, Bankrahat
74 *Sminthurides parvulus* (Krausbauer, 1898)	North 24 Pgs, South 24 Pgs	Barrackpore, Bankrahat
75 *Sphaeridia pumilis* (Krausbauer, 1898) Agrell, 1934	Kolkata, North 24 Pgs, Bankura	Indian Botanical Garden, Bibhuti Bhusan WLS, Lokpur.

World's Oldest Organism

Norwegian scientists have claimed that they have found one of the world's oldest living organisms and man's remotest relative — after spending decades examining a microscopic algae-eater that lives in a lake in Norway. They have invented a new category of organism for it called *Collodictyon* because it is not an animal, plant, parasite, fungus or alga, they said. The elusive, single-cell creature evolved about a billion years ago.

Westward Range Extension of the Moth, *Amata sperbius*, (Lepidoptera: Erebidae) to Nepal

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Introduction

On the Indian subcontinent, *Amata sperbius* (Fabricius, 1787) was reported from Sikkim to Burma (Hampson, 1898). It was subsequently recorded from Bihar (Fletcher, 1925), Maharashtra and Sri Lanka (Gurule et al., 2010). Beyond the Indian subcontinent, it has been reported from China, Singapore, Indonesia, the Philippines (Gurule et al., 2010) and Korea (Przybyowicz et al., 2016).

Observations

Opportunistic Lepidoptera surveys were conducted on the premises of the Institute of Forestry, Pokhara (Nepal) between February, 2017 and August, 2018. During the daytime, butterflies and moths were observed and photographed, while a mercury vapour lamp at night served to attract moths, which were then photographed and identified.

A. sperbius was photographed on 4th May, 2017 in the morning survey (8am to 12 pm) and on 2ndApril, 10th May, 19th June and 3rd August, 2018, both at night and during the day time. During the month of June, 2018, it was first observed settling on a leaf of *Calotropis*, the remaining observations were on grass. It is a low-flying moth, which settles frequently.

Material Examined

1 male, 3 females: 3 August 2018, Pokhara, Nepal.
Forewing length: 13-14 mm.
In Coll. S. Panthee, Pokhara, Nepal.

Result and Discussion

This species was erroneously reported from Delhi by Singh et al. (2014), who gave the primary source for this information as Fletcher (1925). However, Fletcher (1925) does not mention Delhi in the moth's distribution. It is possible that Singh et al. (2014) confused the town of Pusa in Bihar with the Indian Agricultural Research Institute in Delhi, since this institute is familiarly known as the Pusa Institute. The Institute, then the Imperial Agricultural Research Institute, was shifted from Pusa, Bihar to Delhi in 1936 following a major earthquake, so it is quite certain that the Pusa referred to by Fletcher (1925) was, in fact, the town in Bihar.

Haruta (1992-2000) edited six volumes on the moths of Nepal based on extensive surveys throughout the country. However, *A. sperbius* was not recorded in this work.

Our records over a period of 2 years strongly suggest that the moth is a resident in Nepal and is active for a limited period during the year. The present records constitute a north westward extension to the known distribution of this species, from Pusa, Bihar (25°57'N and 85°40' E) to Pokhara (28°16' N and 83°58'E).

There is no reason to suppose at present that this range extension is a recent one. In fact, not enough data is available to assess whether this is indeed the case. In the event, it is an addition to the known fauna of Nepal and, since Pokhara is in central Nepal, the moth's presence east of Pokhara may be reasonably assumed, rather than believe that such a common and widespread moth exists in an isolated population in Pokhara.

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