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Saturday 24-06-2023
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ಇನ್ನು 4-5 ವರ್ಷ ರಾಜ್ಯದಲ್ಲಿ ಮಳೆ ಕೊರತೆ?

ಎಲ್‌ನಿನೋ ಪರಿಣಾಮ ದೇಶದಲ್ಲಿ ಮಳೆ ಕೊರತೆ ಸಂಭವ | ಅಲ್ಪಾವಧಿ ಬೆಳೆಗಳತ್ತ ರೈತರನ್ನು ಸೆಳೆಯುತ್ತಿರುವ ಕೃಷಿ ವಿವಿ

• ಗಿರೀಶ್ ಗರಗ
ಕನ್ನಡಪ್ರಭ ವಾರ್ತೆ ಬೆಂಗಳೂರು

ಪೆಸಿಫಿಕ್ ಮಹಾಸಾಗರದಲ್ಲಿ ಉಂಟಾಗಿರುವ ಎಲ್‌ನಿನೋ ಪರಿಸ್ಥಿತಿಯಿಂದಾಗಿ ರಾಜ್ಯ ಮತ್ತು ದೇಶದಲ್ಲಿ ಮುಂದಿನ ನಾಲ್ಕೈದು ವರ್ಷ ಮಳೆಯಕೊರತೆಉಂಟಾಗಲಿದೆ. ಹೀಗಾಗಿ ಪ್ರಮುಖ ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು ರೈತರನ್ನು ದೀರ್ಘಾವಧಿ ಬೆಳೆಗಳ ಬದಲು ಅಲ್ಪಾವಧಿ ಬೆಳೆಗಳತ್ತ ಸೆಳೆಯುವ ಕಾರ್ಯಕ್ಕೆ ಮುಂದಾಗಿವೆ.



ಪೆಸಿಫಿಕ್ ಮಹಾಸಾಗರದಲ್ಲಿನ ಪರಿಸ್ಥಿತಿ ಪ್ರಪಂಚದ ಬಹುತೇಕ ಭಾಗಗಳಲ್ಲಿ ಮಳೆಯ ಪ್ರಮಾಣವನ್ನು ನಿರ್ಧಾರ ಮಾಡುತ್ತದೆ. ಮಹಾಸಾಗರದ ಉಷ್ಣಾಂಶದ ಏರಿಳಿತದಿಂದ ಉಂಟಾಗುವ ಎಲ್‌ನಿನೋ ಮತ್ತು ಲಾನಿನೋ ಪರಿಸ್ಥಿತಿಗಳು ಏಷ್ಯಾ, ಅಮೆರಿಕಾ, ಆಸ್ಟ್ರೇಲಿಯಾ ಖಂಡಗಳಲ್ಲಿ ಮಳೆಯ ಪ್ರಮಾಣ ಯಾವ ಮಟ್ಟದಲ್ಲಿರಲಿದೆ ಎಂಬುದನ್ನು ನಿರ್ಧರಿಸುತ್ತವೆ. ಪ್ರತಿ ನಾಲ್ಕರಿಂದ ಐದು ವರ್ಷಕ್ಕೊಮ್ಮೆ ಪೆಸಿಫಿಕ್ ಮಹಾಸಾಗರದಲ್ಲಿನ ಪರಿಸ್ಥಿತಿ ಬದಲಾಗುತ್ತದೆ.

ಈಗ ಪೆಸಿಫಿಕ್ ಮಹಾಸಾಗರದಲ್ಲಿ ಉಷ್ಣಾಂಶ ಹೆಚ್ಚಾಗಿದ್ದು ಎಲ್‌ನಿನೋ ಪರಿಸ್ಥಿತಿ ನಿರ್ಮಾಣವಾಗಿದೆ. ಇದರಿಂದಾಗಿಯೇ ಏಷ್ಯಾ ಮತ್ತು ಆಸ್ಟ್ರೇಲಿಯಾಗಳಲ್ಲಿ ಮಳೆಯ ಪ್ರಮಾಣ ಕಡಿಮೆಯಾಗಿದೆ. ಈ ಪರಿಸ್ಥಿತಿ ಇನ್ನೂ ನಾಲ್ಕೈದು ವರ್ಷಗಳವರೆಗೆ ಇರಲಿದ್ದು, ಆಷ್ಟೂ ವರ್ಷ ಮಳೆಯ ಪ್ರಮಾಣ ವಾಡಿಕೆಗಿಂತ ಕಡಿಮೆ ಸುರಿಯಲಿದೆ. ಹೀಗಾಗಿ ರಾಜ್ಯ ಮತ್ತು ದೇಶದಲ್ಲಿ ಕೃಷಿ ಚಟುವಟಿಕೆಯಲ್ಲಿ ಪರ್ಯಾಯ ವ್ಯವಸ್ಥೆ ಮಾಡಿಕೊಳ್ಳಬೇಕಾದ ಅನಿವಾರ್ಯತೆ ಎದುರಾಗಿದೆ.

ಪರ್ಯಾಯ ಕೃಷಿ: ಮಳೆ ಕೊರತೆಯ ಮುನ್ಸೂಚನೆ ದೊರೆತ ಕಾರಣದಿಂದಾಗಿ ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳು ತಮ್ಮವ್ಯಾಪ್ತಿಯ ಜಿಲ್ಲೆಗಳಲ್ಲಿನ ರೈತರನ್ನು ದೀರ್ಘಾವಧಿ ಬೆಳೆಗಳಿಂದ ಅಲ್ಪಾವಧಿ ಬೆಳೆಗಳತ್ತ ಸೆಳೆಯಲು ಮುಂದಾಗಿವೆ. ಪ್ರಮುಖವಾಗಿ ಮಲೆನಾಡು ಹೊರತುಪಡಿಸಿ ಉಳಿದ ಕಡೆಗಳಲ್ಲಿ ಮಳೆಯಾಧಾರಿತ ಕೃಷಿ ಮಾಡುವ ರೈತರನ್ನು ಸಂಪರ್ಕಿಸಿ ಮಳೆ ಕೊರತೆ ಬಗ್ಗೆ ಮಾಹಿತಿ ನೀಡುತ್ತಿವೆ. ಅಲ್ಲದೆ, ಭತ್ತ, ಕಬ್ಬು ಸೇರಿ ಇನ್ನಿತರ ದೀರ್ಘಾವಧಿ ಬೆಳೆಗಳ ಬದಲು ಅಲ್ಪ ಕಾಲದಲ್ಲಿ ಫಸಲು ನೀಡುವ ಸಿರಿಧಾನ್ಯಗಳತ್ತ ಗಮನಹರಿಸುವ ಸೂಚಿಸಲಾಗುತ್ತಿದೆ. ಕೃಷಿ ವಿಜ್ಞಾನ ಕೇಂದ್ರಗಳ ಮೂಲಕ ರೈತರನ್ನು ಸಂಪರ್ಕಿಸಿ ಈ ರೀತಿಯ ಜಾಗೃತಿ ಮೂಡಿಸಲಾಗುತ್ತಿದೆ. ರೈತರಿಗೆ ಪರ್ಯಾಯ ತಳಿಯ ಬೀಜಗಳನ್ನು ವಿತರಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಗುತ್ತಿದೆ.

ಸೆಪ್ಟೆಂಬರ್‌ನಲ್ಲಿ ತೀವ್ರ ಮಳೆ ಕೊರತೆ

ರಾಜ್ಯದಲ್ಲಿ ವಾರ್ಷಿಕ ಸರಾಸರಿ 1,200 ಮಿಮೀ ಮಳೆ ಸುರಿಯುತ್ತದೆ. ಈ ಪೈಕಿ ಮಳೆಗಾಲದಲ್ಲಿಯೇ 1 ಸಾವಿರ ಮಿ.ಮೀ. ಗಿಂತ ಹೆಚ್ಚಿನ ಮಳೆಯಾಗುತ್ತದೆ. ಆದರೆ, ಈ ಬಾರಿ ವಾಡಿಕೆಗಿಂತ ಕಡಿಮೆ ಮಳೆಯಾಗಲಿದೆ. ಜೂನ್, ಜುಲೈ ಮತ್ತು ಆಗಸ್ಟ್‌ನಲ್ಲಿ ಶೇ.3 ರಿಂದ ಶೇ.4ರಷ್ಟು ಕಡಿಮೆ ಮಳೆ ಸುರಿಯಲಿದೆ. ಸೆಪ್ಟೆಂಬರ್‌ನಲ್ಲಿ ಮಳೆಯ ಪ್ರಮಾಣ ತೀರಾ ಕಡಿಮೆಯಾಗುವ ಸಾಧ್ಯತೆಗಳಿವೆ.

ಏನಿದು ಎಲ್‌ನಿನೋ?

ಪೆಸಿಫಿಕ್ ಮಹಾಸಾಗರದಲ್ಲಿ ಉಷ್ಣಾಂಶ ಹೆಚ್ಚಾಗಿ, ಮಳೆಯಮಾರುತದಿಕ್ಕುಬದಲಿಸುವಪರಿಸ್ಥಿತಿಯನ್ನು ಎಲ್‌ನಿನೋ ಎಂದು ಕರೆಯಲಾಗುತ್ತದೆ. ಈ ಪರಿಸ್ಥಿತಿಯಲ್ಲಿ ಮಳೆ ಮಾರುತಗಳು ಅಮೆರಿಕಾ ಕಡೆಗೆ ತೆರಳಲಿದ್ದು, ಏಷ್ಯಾ ಮತ್ತು ಆಸ್ಟ್ರೇಲಿಯಾ ಖಂಡಗಳಲ್ಲಿ ಮಳೆಯ ಪ್ರಮಾಣ ಕಡಿಮೆಯಾಗುತ್ತದೆ. ಮುಂದಿನ ನಾಲ್ಕೈದು ವರ್ಷಗಳ ನಂತರ ಲಾನಿನೋ ಪರಿಸ್ಥಿತಿ ಸೃಷ್ಟಿಯಾಗಿ, ಉಷ್ಣಾಂಶದ ಪ್ರಮಾಣ ಕಡಿಮೆಯಾಗುತ್ತದೆ. ಆಗ ಮಳೆ ಮಾರುತಗಳು ಏಷ್ಯಾ ಮತ್ತು ಆಸ್ಟ್ರೇಲಿಯಾದತ್ತ ಬರಲಿದ್ದು, ಮಳೆಯ ಪ್ರಮಾಣ ತೀವ್ರವಾಗಿ ಹೆಚ್ಚಾಗಲಿದೆ.

ಪೆಸಿಫಿಕ್ ಮಹಾಸಾಗರದಲ್ಲಿ ಎಲ್‌ನಿನೋ ಪರಿಸ್ಥಿತಿ ಉಂಟಾಗಿರುವ ಕಾರಣ, ರಾಜ್ಯದಲ್ಲಿ ಮುಂದಿನ ನಾಲ್ಕೈದು ವರ್ಷ ಮಳೆಯ ಪ್ರಮಾಣ ಕಡಿಮೆ ಇರಲಿದೆ. ಹೀಗಾಗಿ ರೈತರು ಕಡಿಮೆ ಅವಧಿಯಲ್ಲಿ ಫಸಲು ನೀಡುವ ಅಲ್ಪಾವಧಿ ಬೆಳೆಗಳತ್ತ ಗಮನಹರಿಸಬೇಕು. ಈ ಕುರಿತಂತೆ ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ ಕೂಡ ರೈತರಿಗೆ ಅರಿವು ಮೂಡಿಸುತ್ತಿದ್ದು, ಅದಕ್ಕೆ ತಕ್ಕಂತೆ ಬೀಜ ವಿತರಣೆ ಮಾಡಲಾಗುತ್ತಿದೆ.

• **ಡಾ. ತಿಮ್ಮೇಗೌಡ** ಕೃಷಿ ಹವಾಮಾನ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಬೆಂಗಳೂರು ಕೃಷಿ ವಿವಿ

24-06-2023
Kannadaprabha Pg 06

Delayed monsoon: Maha farmers sow only 1% of total cultivable area

SUDHIR SURYAWANSHI @ Mumbai

AN erratic monsoon has badly hampered sowing in Maharashtra. Government sources said as of now, only 1.09% of the total cultivable area has been sown in the state.

The state government has advised farmers that they should not start sowing unless there is satisfactory rainfall. It said that sowing has been delayed due to the "staggering monsoon." According to the state agriculture department data, in kharif season, 142 lakh hectares, excluding sugarcane land, has to be sown, but out of it, only 1.66 lakh hectare was sown till June 16, which is a mere 1.09% of the total cultivable area. Last year around the same time, 13, total 1.44 lakh hectare was reported to be sown in the state.

The data stated that this year there is 13.3% rainfall (average 110.7 mm rainfall) between June 1 and 16 against 36.9% rainfall last year in the same period. Out of 335 tehsils, 297 received 0 to 25% rainfall while 50 tehsils received 25-to-50% rainfall and 8 tehsils got 50% to 75% rainfall.

"In some parts of the state's irrigated land, cotton, rice, and corn sowing has started, but farmers have yet to start the sowing on non-irrigated land. Farmers are engaged in pre-monsoon work," stated a government report.

In the Konkan region, paddy plantations take place early, but this year, the erratic monsoon has delayed that plantation. In Palghar district, the average paddy cultivation land is 7664.42 hectares, out of it, only 473.13 hectares land that is 6.17 % have been cultivated with paddy crops so far against 1,400 hectares last year in the same period.

A senior government official said officials are compiling data that will be presented to the cabinet meeting. "We are in the last days of the third week of June and there has been no rain. The next week's data will give more clarity on how much land has been cultivated in comparison with the previous year. The situation is grim," said the official.

Chief Minister Eknath Shinde did not call the cabinet meeting on Tuesday. Sources said a communication gap between him and his deputy Devendra Fadnavis is widening and that has been hampering the administration's decisions. "Key meetings due this week are a casualty of it," said the source.

Rainfall dips, plantation delayed

Govt data shows this year, only **13.3%** rainfall was registered between June 1 and 16 against **36.9%** rainfall last year in the same period

In Palghar dist, the average paddy cultivation area is **7664.42 HA**, out of it, only **473.13** hectares which is **6.17%** have been cultivated with paddy crops so far. last year in the same period against 1,400 hectares

In Konkan region, paddy plantation takes place early, but this year, the erratic monsoon has delayed that plantation

Out of 335 tehsils, 297 received 0 to 25% rainfall while 50 tehsils received 25-to-50% rainfall and eight tehsils got 50% to 75% rainfall

24-06-2023
Ind Exp Pg 16

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'Like millets, baobab trees travelled from Africa to India — and even to Australia'

***Haripriya Rangan** teaches geography and environmental sciences at the University of Melbourne. She tells **Times Evoke** about how plants have traversed the world:*

Photos: iStock



WHEN ROOTS SPREAD: Africa's iconic baobab tree moved to India and Australia from ancient times, driven by climatic changes, planetary movements and people

Human history, encompassing the way we live, what we consider our culture and what we eat, is bound up with vegetation which creates landscapes around us. From the oldest times, Earth has seen the movement of plants, animals and insects over vast areas, creating ecosystems as they settled. Scientists studying ancient pollen deposits found plants which originated in one place travelled to the other end of the world. Sometimes, these were carried by winds or seas. At other times, they were transported by animals, birds — and people.



From the European colonial period, especially after the Americas were discovered, unusual and profitable plants intrigued explorers. They began transporting plants to Europe, first as curiosities which were planted in the gardens of kings, queens and nobles. Then, they developed plants with commercial value, which drove the modern movement of flora across Earth. But plants had been on the move even before. Sorghum and pearl millets came to India from Africa some 3,500 years ago. Interestingly, they travelled in a time of widespread aridification — there was a lot of movement of people then because of climatic changes. Archaeological evidence shows that as civilisations shifted, so did their plants. Later, traders and explorers brought chillies and tomatoes to India which, like millets, got assimilated into the Indian landscape and diet.



FREQUENT FLYER: The tomato travelled far with sailors, soldiers and merchants

EXPANSION

The baobab tree is another intriguing — and well-travelled — plant. Originating in Africa, it is found today in the Kutch and Kathiawar peninsula, Goa, Malwa and the south-central Deccan plateau in Andhra Pradesh. Rulers played a key role in influencing its travel plans — the king of Mandu employed soldiers from East Africa who carried baobab pods as a lightweight source of protein and vitamins. Similarly, Hyderabad's rulers employed African cavalry and there are still baobabs standing where their military settlements were located, representing the movement of militias from Ethiopia, Zanzibar, Tanzania, Mozambique, etc., to India.

The baobab even travelled to Australia. How it got there is a fascinating question. Despite Australia being much larger than Madagascar, which has six species of baobabs, the tree has only one relative, the boab, in the Kimberly region of north-west Australia. Jack Pettigrew, a geneticist, argued the plant was carried by people as they spread out of Africa, taking the southern route past the Indian subcontinent across southeast Asia into northern Australia, where it became restricted to the Kimberly. Our research explored whether there was variation across the baobab's natural range in Australia. The Kimberly has distinct biological barriers that drove the evolution of mammals like rock wallabies. If the baobabs had been spread by animals or water, there could have been similar patterns among them. However, we found a lot of gene flow but very little variation among baobabs in the Kimberly. This indicated that in fact, humans had carried baobab seeds.

That could have occurred around the Ice Age when the Australian continental shelf extended much further out. Boabs would have existed on the exposed portion of the shelf, used by indigenous groups. When this era ended 21,000 years, sea levels rose — those trees would have been destroyed by flooding while, driven inland by rising waters, Aboriginal groups would have moved into central and eastern Kimberly, carrying boab pods with them. As the trees spread, so did the words for them. We found linguists who were studying how terms for the baobab had been shared and borrowed across Aboriginal languages — working together, we found a broad matching between the words and the gene flow of the tree. This again reflected human agency with Aboriginal people carrying the seeds and cultivating it.

Such journeys by plants shows how our ancestors were always on the move. They also carried certain seeds and crops which they tried to plant in new places. Some did well and spread. People were always experimenting with plants — today too, many adaptations are taking place. About 20 years ago, eating millets or brown rice wasn't mainstream. Today, so many people eat quinoa that South Americans, for whom quinoa is an everyday staple, often find it all exported. Changes in crop patterns are driven partly by evolving tastes and partly by resilience to altering climatic factors. Plants which prove to be the hardiest travel the farthest across the globe. They often carry humanity's oldest — and newest — stories with them.

READERS WRITE

Dear Times Evoke,

Ami Vitale's views (June 17th, 2023) on ecological photographers made a very interesting read. Her collective aims to support the next generation of photographers who will raise planetary awareness. The picture of the grizzly bear crossing a busy road with her baby pushed you to think. A photo's power to create empathy is unparalleled — thank you, TE!
—Shruti Chatterjee, Kolkata

I was thrilled to read another wonderful article in TOI's TE! Be it fungi, gardens or millets, it's so refreshing to read TE's beautifully presented features. Ami Vitale provided deep insights into the links between the environment, humanity and climatic changes. Through nature photography, such story-telling will get a boost. Looking forward to more such amazing TE reads!
—Ravi, Secunderabad

Times Evoke is by far my favourite newspaper section and the TE article with Ami Vitale was excellent! The picture of the three tigers was breath-taking as was the firefighters just next to them. These showed nature's beauty versus the damage we humans are doing to Earth. TE, please keep featuring such inspiring personalities.
—Amita Upadhyay, Delhi

The insights from Ami Vitale on environmental photographers were extremely informative. It was quite an eye-opener to read about the positive role of photographers also as representatives of wildlife and nature, which is no longer shown as remote from our lives. Thank you for such a wonderful feature, TE!
—Dr Mayank Agrawal, Alwar

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Kaapi Kick

Cappuccino



- Boil the milk in a saucepan with a cinnamon stick
- Simmer the milk for a few minutes
- Remove the cinnamon stick and mix in some sugar and half a cup of coffee
- Sprinkle ground cinnamon and serve hot

IRISH COFFEE

- Whip cream until its thick and place it in the refrigerator
- Dissolve sugar in hot water and allow it to boil
- Add freshly-brewed rich coffee and stir well
- Remove it from the heat and stir in whisky
- Pour the mix of whisky, coffee and sugar into a glass
- Pour in cold cream



Make berries in their natural form a part of your daily diet, advises **Sheela Krishnaswamy**

Nutrient-rich berries add value to balanced diet

Berry Good

Decades ago, we knew of only gooseberries, Indian plum (ber) and a few other indigenous berries. Now, the markets are flooded with many other varieties such as strawberry, raspberry, blackberry and blueberry. Products made from berries – cranberry juice, elderberry jelly, blueberry preserve, strawberry smoothie, gooseberry pickle, mulberry jam and several others dot the supermarket shelves.

Berries are also used in cakes, pies, cookies and other dishes, desserts and toppings in particular. Juices made from cranberry, goji berry and acai berry created a lot of buzz some time ago but quickly went quiet, like most of the hyped foods do.

Berries were consumed thousands of years ago, till they started to be cultivated some Centuries ago. Today, berries are grown in many parts of the world and flown to other parts.

Why are berries so popular?

Besides their delicious taste, they are nutrient-rich. They have a high moisture content, and are a good source of fibre, folate and Vitamin C. Gooseberry stands tall above all berries in its Vitamin C content at 252 mg in 100 gm, and polyphenol content at 1,031 mg in 100 gm. Berries also contain small amounts magnesium, calcium and potassium. Their sweetness comes from sugars (fructose and glucose) present naturally in berries.

The rich colours of berries come from phytochemicals, especially anthocyanins which contain antioxidant properties. Flavonoids, another group of antioxidants, are found near the skin of berries. Studies show that the bioactive compounds in berries, either individually or combined, contribute to various health benefits such as prevention of inflammation disorders, cardiovascular diseases or protective effects to lower the risk of various cancers.

Indian gooseberry (aka amla) is widely used in Ayurvedic medicine for different ailments. Amla extract has been used for various biological effects like antimicrobial, antioxidant, gastro-protective, anti-cancer, hepato-protective, cardio-protective, radio-protective, anti-inflammatory, anti-diabetic, neuro-protective and immune-modulatory effects, owing to its bioactive components. However, no single berry or a collective group of berries can provide complete health solutions to any person. When combined with a well-balanced diet, berries help improve the nutrient value of the diet and also help in prevention of diseases.

Since the shelf life of fresh berries is short, they are made into preserves, jams, jellies or pickles to last longer.



However, most of these foods may have added sugar, salt and/or other additives to enhance acceptability, but are not nutritionally beneficial. Look for products that do not contain sweetening agents, high sodium additives or artificial ingredients. Better still, go for fresh berries to enjoy their natural taste and health benefits.

(The author is a nutrition and wellness consultant)

24-06-2023
Dec Hrd add Pg 02

Dancing with death

Seshadri K S explores the fascinating world of insect dances that leads to studying animal behaviour

24-06-2023
Dec Hrd Pg 07

In October last year, I witnessed a dazzling performance of Flamenco in Spain. With sharp stomping of the floor, claps, and elegant gyration of the body, the dancer exuded a sense of raw power. The performance lasted under an hour, but it left me pondering how such elaborate forms of visual displays have evolved.

The most famous example is the waggle dance by bees. Although Aristotle had observed and written about it, the behaviour was decoded only in 1927 by a German-Austrian biologist, Karl Von Firsch.

Closer home, the pesky fruit flies also dance. The male fruit fly (Drosophila melanogaster) follows the female, alternatively opening one wing and vibrating it, repeating the pattern before attempting to mate with her. Clearly, insects are capable of processing contextual information and communicating accordingly, be it a food source or a potential mate.

Multitude functions of insect wings

Insect wings are thin and delicate but are often resilient. Winged insects appear in fossil records dating back to nearly 350 million years ago, during the carboniferous period of the earth's geological history. Since then, wings have enabled insects to colonise the earth as no other creature could have.

Insects face a constant threat of predation. Many insects have wing patterns that look like bark or a twig. They masquerade as a dead twig or a blade of dry grass. The potential predator may move on, thinking the insect is a non-living entity. In a counter-intuitive strategy, many insects make their presence felt by a predator.

Some species of insects such as the Praying mantis, have eye-like patterns on their wings. When they are threatened, they fold their front arms, raise their body, and open their wings. The sudden appearance of an eye-like pattern startles the predator, while the insect escapes.

Along came a spider

Actively displaying wings to potential predators aims to distract them. One such strategy to dance upon perceiving a threat is seen among the Mexican fruit fly (*Anastrepha ludens*). When they spot a predator, these small insects measuring about 11 mm long raise their rear end and put on a show to a potential threat.



Phidippus audax. PHOTO BY DINESH RAO

Spiders typically have four pairs of eyes. Jumping spiders are a diverse group of spiders which have a pair of large, forward-facing eyes that are incredibly sensitive to movement. In a recent research paper published in the *Journal of Experimental Biology*, Professor Dinesh Rao and a team of international researchers shed new light on this behaviour. They began by placing a spider and a fly in a partitioned petri-dish.

"After giving them a minute to settle down, we removed the partition, exposing the predator and prey to each other. As soon as the spider detected the fly, it would turn around and face the fly. Some of the flies would then start making looping movements with their wings held open," said Prof. Rao, based at the Universidad Veracruzana, Mexico.

Their team filmed these encounters and analysed the videos to determine the direction of the spider's gaze using a computer program. The gaze of the spider was found to be fixed on the fly's head, but the direction differed when the fly danced versus when it did not.

"It appeared that the spiders were rather distracted when the flies made looping motions. Thus, we performed another set of experiments where we tracked the retinal movement of the spider's eyes by making them watch videos of the fly" he added.

Can dance be distracting?

In a laboratory set-up, they immobilised the spider with beeswax and projected videos on a screen, while tracking their retinal movement using a specialised eye tracker. Each spider was shown three videos, one where the fly remained still, another where it simply moved, and another where it performed the loopy dance with its wings.

Analysing the eye tracker data, they found that the spiders had a difficult time focusing on the fly when they performed the looping dance. However, the spider was able to focus on the fly that moved without flailing its wings.

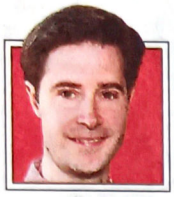
The fly has a banded pattern appearing as shiny patches on the wing. They tweaked the lighting conditions and found that the shininess of the wing did not distract the spider, but they were distracted when they could see the iridescent sheen on the wing.

Finally, they made a composite motion flow diagram of the moving and displaying fly. Motion flow diagrams are made by taking a series of photographs with landmarks and later overlayed to determine which parts of the body moved in which direction. While the body parts of a walking fly moved in the same direction, those of the dancing flies moved in different directions, thus confusing the spider.

Based on these experiments, the team concluded that the dancing display of the Mexican fruit fly was effective in distracting the spider. Prof. Rao speculates that such strategies underscore the importance of carefully observing nature to be able to gain novel insights into the fascinating field of animal behaviour.

(The author is an ecologist and a faculty at ATREE)

'Ancient flower fossils can have beautifully intact petals'



***Andrew Leslie** teaches earth and planetary sciences at Stanford University. Speaking to **Times Evoke**, he traces the evolution of plants through deep time:*

Photo Courtesy: A. Leslie



GOLDEN WONDERS: Pseudolarix or the 'golden larch' is a living conifer native to eastern China — its matured seed cones fall apart, releasing winged seeds

As a palaeontologist and natural historian, I research why plant forms evolved different shapes and how leaves, cones, etc., developed. I combine information from the fossil record with data from living plants to see, for instance, what exactly a pine cone does, what its different parts are and how these function together to make it thrive. This helps us track evolutionary relationships among groups (the science called phylogeny) and interpret current adaptations. I also explore land plants and their reproductive biology — this is fundamental to our existence as we all eat the fruit of seeds.

Initially, the world only had plants in the sea but our research found two bursts of plant diversification which occurred 250 million years apart, yielding land-based flora. We were quantifying complexity in plant parts and found a rise in the Devonian period. From mosses, ferns emerged and then came conifers, developing over this 40-million-year duration. Then, around 130 million years ago in the Cretaceous period, there was a dramatic burst of evolution among flowering plants. They developed parts and complicated structures, a flower showing symmetry, planning, colour, etc., for a purpose. These features shape human ideas of aesthetics in ways plain seed plants don't.

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The development of how plants could reproduce was also extraordinary. We use functional morphology to study conifers. All conifers are wind-pollinated and don't use insects or birds. But conifer pollen grains can have air bladders on them called saccate. These are very common in the fossil record, particularly from the Permian to the Jurassic eras, 270 million to 100 million years ago. This was widespread but is now restricted just to conifers and only some varieties.

These air bladders work in floatation mechanisms — the seed in a conifer cone faces down with respect to gravity. This lets the seeds release little droplets which make any grains float up and into the ovule — this means the plant can collect pollen grains around the seed and transfer them to where they can fertilise. I studied living plants and found this does a good job of moving buoyant pollen with air bladders across seeds. People think conifers have a very basic pollination method of aerial dispersal but to capture those pollen grains onto young seed cones is a highly complex abiotic process, involving everything from the right wind currents to this floatation strategy.

I'm always amazed at nature's preservation of plants. I've come across perfect fossilised species which are over 300 million years old. Plants are preserved as pollen imprints on rocks to charcoalified flowers with petals and stamens. You can find something that's turned black but still has these delicate features, beautifully intact. I've found tiny bits which even preserve details of cell structure — studying remnants of the Cretaceous era, we found wonderfully preserved little flowers and conifer cones. The most interesting fossil I've seen so far was in a coal mine in Mongolia — these were beautiful spruce cones which could be from someone's garden now.

But while plants can be preserved over time, there are rapid changes now in their ecology, ranges and phenology or when flowers blossom. Plants are extremely sensitive to fluctuations in temperature and climate. They are now responding almost in real time to these, also altering their traits, seed size, drought tolerance, etc. Plants thus truly symbolise both Earth's past — and its future.

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ALL SPRUCED UP: The coniferous tree, which needs no birds or insects for pollination, dates 136 million years

Photo Courtesy: A. Leslie



KEPT PERFECTLY: This part-coal fossil cone is from an extinct 100-million-year-old spruce from Mongolia

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