Topics

P versus NP
problem

Liquid Nitrogen

Spices board of india Red sea

Venture capital

Mains

By saurabh pandey sir

Target Mains 2024/25 - essay topic Q

Explain the role of spice board of india can play in agricultural diversification in North eastern part of india .

प्रश्न भा रत के उत्तर पूर्वी भा ग में कृषि वि वि धी करण

में स्पा इस बो र्ड ऑफ इंडि या की क्या भूमि का हो सकती है, इसकी व्या ख्या करें।

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Q. 'Climate Change will alter the pace of economic growth'. Discuss (150 words)

Ans. RBI's Department of Economic and Policy Research has mentioned in its recent report that the climate change in India could cost 2.8% of its economy and will depress the standard of living of nearly half of its population by 2050.

Impact of climate change on economic growth

1) **Agriculture** :- As climate change occurs, the weather patterns, rainfall, Increase in temperature all leads to decrease in the generation of crops yield.

2) **Energy crisis** :- As the temperature keeps on rising the demand for energy increases, (more will be produced via coal based thermal power plants).
Acc. to International Energy Agency - India's primary energy demand will be doubled by 2030.

3) **Health complications** : With increase in heat the incidents of deaths due to diarrhoea, malaria and heat stress have increased by manyfolds, thus a threat to the working population of the country.

4) **Labour Force Exposure** :- labours indulged in

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working at construction & building sites (12% of India's workforce) faces extreme heat effects. due to urban-heat island effect at these sites. As a result of which:-
* No. of working hours are reduced
* More exposure of heat have negative impact on their over-all well being.

5) **Damaged infrastructure** :- Due to climate change Extreme weather events takes place, which results into damaging of the infrastructure of roads, bridges, ports, power plants, thus will directly impact the economic trade activity, connectivity

Way Forward :-

(i) Need to amend laws - to include in → safety and health aspect of the working force to free from adverse effects of the climate change (Recognised as Fundamental Right by SC recently)

(ii) Climate resilient infrastructure & agricultural practices

(iii) More of awareness generating campaigns & initiatives, like National Action Plan on Climate Change

A computer science conundrum that could transform healthcare

While it may sound like a cryptic puzzle reserved for computer science mavens, the implications of the P versus NP problem stretch beyond algorithms and data structures, rippling through diverse fields, including antimicrobial resistance, cancer care, and medical insurance

C. Aravinda

In the 17th century, a Dutch draper named Anton van Leeuwenhoek used a small handmade microscope to peer into a world previously unseen by the human eye. Thus he discovered microorganisms and gave rise to the field of microbiology. It offered solutions to challenges in healthcare that until then had seemed intractable.

Today, we face a new set of complex problems in healthcare that seem more intractable than others before for their inherent complexity and the constraints they threaten to impose on resources.

P versus NP

It so happens that an unsolved problem in computer science, simply called the P versus NP problem, could hold the key to these modern-day conundra. While it may sound like a cryptic puzzle reserved for computer science mavens, its implications stretch beyond algorithms and data structures, rippling through diverse fields including healthcare. But what exactly is this puzzle, and how could its resolution unlock a new era in medical science?

Let's start with a simple arithmetic example. Say you're asked to multiply 17 with 19. With some time, you'd arrive at the answer: 323. This is a 'P' problem: you can solve it reasonably quickly. ('P' stands for polynomial time.) Suppose you're presented with 323 and asked to identify the two prime numbers multiplied to get this. In this case, you will have to take the trial and error route until you arrive at 17 and 19. This is an 'NP' problem: it takes longer to solve, but once you have the solution, you can verify it quickly. ('NP' here is nondeterministic polynomial time.)

Healthcare is filled with complex issues. Consider scheduling in a hospital: assigning doctors and nurses to shifts, booking operating theatres for surgeries, and organising patient appointments. It is an intricate puzzle that requires considering various factors – staff availability, urgency of medical cases, etc. – and potential changes such as emergency cases and cancellations.

The P vs NP question is this: could there be a shortcut to solve 'NP' problems as quickly as 'P' problems? Because the implication is that if P equals NP, we could quickly find the optimal solution to these scheduling problems, thus significantly improving patient care.

The implications of resolving this question are profound and wide-reaching, including for healthcare.

Implications for healthcare

The P vs NP question is a problem in mathematics and computer science, but that does not mean it will be confined there. If an existing problem can be given a faithful mathematical representation and is found to be an 'NP' problem, the shortcut in question could help by turning it into a 'P' problem.

For example, antibiotic resistance is a significant global health concern. If P equals NP, we may have a way to quickly analyse bacterial genomes and predict their resistance patterns, helping doctors prescribe the most effective antibiotics. This would improve patient outcomes and help combat antibiotic resistance, including new antibiotics discoveries for emerging diseases. Of course, patients' adherence will still matter.

Cancer is a complex disease with myriad mutations. Deciding the best treatment plan is an NP problem because it involves considering all possible combinations of drugs and therapies. If P equals NP, we may have an opportunity to swiftly identify the optimal treatment for each individual cancer patient and potentially save many lives. The catch here is that we will still need a large volume of data.

Insurance companies grapple with NP problems when they have to determine premiums and packages based on considering numerous variables like age, health status, lifestyle, and medical history. Having a shortcut to crack the P vs NP problem could help these companies optimise their decision-making and pave the way to fairer and more accurate premiums and conditions. Further, government spending on healthcare can also be utilised with minimal leakage while programmes like Ayushman Bharat can contribute more effectively to achieving universal health coverage.

By solving these complex problems more efficiently, we could potentially dramatically reduce resource constraints and improve health outcomes.

Surprising sources of progress

While the P vs NP problem is a topic of ongoing study in computer science, the consensus among most experts is that P probably does not equal NP, implying that some problems will remain very difficult to crack, even if a solution – once it is found – will be easier to verify. But this has not deterred researchers from exploring this question, and in the pursuit of which they have unearthed improvements to algorithms and new approaches to dealing with complex problems.

Throughout history, there have been many instances of seemingly insurmountable problems being overcome with innovative thinking. Before the discovery of electricity, for example, candlemakers lit our world. Yet most of them may never have foreseen the revolutionary consequences of Thomas Edison's incandescent bulb, which brought light to more people and for longer hours.

Similarly, following the invention of calculus and expanding the binomial theorem to negative integers and fractions, Isaac Newton considerably improved our understanding of the irrational number pi. Why, the technology giant Apple has been transforming our expectations of what a watch can be expected to do in ways that Swiss watchmakers may never have anticipated.

Not all will be winners

This said, one potential drawback of P being equal to NP, if ever that outcome comes to pass, lies in the realm of cryptography. Many encryption schemes and algorithms rely on problems that are currently hard to solve, believed to be in the set of 'NP', not 'P' problems. That is, these schemes protect secrets by hiding them behind a problem that is very hard to solve but easy to verify. If P equals NP, these problems will become easy to solve, rendering these encryption schemes vulnerable to attacks and compromising digital security.

This said, healthcare isn't the sole beneficiary of this problem-solving. The barrier that the P vs NP problem stands for encompasses every field where the solution to a problem is blocked by the availability of significant computational resources. So these fields include logistics, finance, and even climate modelling, all of which could experience paradigm shifts if the P vs NP problem is solved in favour of the P = NP outcome.

The Clay Mathematics Institute in Colorado continues to offer a million dollars to anyone who can definitively solve the P vs NP problem. But for anyone who does, a million dollars will pale in comparison to the rewards they stand to collect by revolutionising various human enterprises, potentially driving human progress in unimaginable ways.

As we look to the future, let us remember that problems that seem insurmountable today might not be so tomorrow. As with the candlemakers, the watchmakers, and even Anton van Leeuwenhoek, the solution often comes from where we least expect it. Today's brightest minds grappling with the P vs NP problem may be on the brink of a breakthrough that could redefine healthcare as we know it.

(Dr C. Aravinda is a public health physician and student at IIT Madras pursuing a BS degree in data science.)

Healthcare is filled with complex issues like assigning doctors and nurses to shifts, booking operating theatres for surgeries, and organising patient appointments. GETTY IMAGES/ISTOCKPHOTO

P versus NP problem

The P versus NP problem is to determine whether ~~every~~ ~~la~~nguage accepted by some nondeterministic algorithm in polynomial time is also accepted by some (deterministic) algorithm in polynomial time. An algorithm is said to be solvable in polynomial time if the number of steps required to complete the algorithm for a given input is for some nonnegative integer , where is the complexity of the input. To define the problem precisely it is necessary to give a formal model of a computer.

In computer programming, a nondeterministic algorithm is an <u>algorithm that</u>, even for the same input, can exhibit different behaviors on different runs, as opposed to a deterministic algorithm.

There are several ways an algorithm may behave differently from run to run

The standard computer model in computability theory is the Turing machine, introduced by Alan Turing in 1936 [37]. Although the model was introduced before physical computers were built, it nevertheless continues to be

accepted as the proper computer model for the purpose of defining the notion of computable function.

Informally the class P is the class of decision problems solvable by some algorithm within a number of steps bounded by some fixed polynomial in the length of the input.

The Hindu analysis by saurabh pandey sir

Liquid Nitrogen ⚠

.~~In 1991, T~~he Hindu reported that a London-based company developed a system to improve the quality and shelf life of food by introducing droplets of liquid nitrogen in the packaging.

When nitrogen evaporates, it displaces oxygen in the food pack, preventing microbial action and preserving freshness.

The technique was useful in packing co ee, potato crisps, peanuts and peanut butter, milk products, cheese, and dried potatoes,

⚠

"Liquid nitrogen, an inert, colourless, odourless ~~cryogenic flu~~id has traditionally been used in the management of many benign pre-cancers and cancers since the 1960s.

The procedure involves using the element at a frosty -196 degrees C to freeze and destroy cancer cells. "The treatment is scientifically described as cryotherapy.

The Hindu analysis by saurabh pandey sir
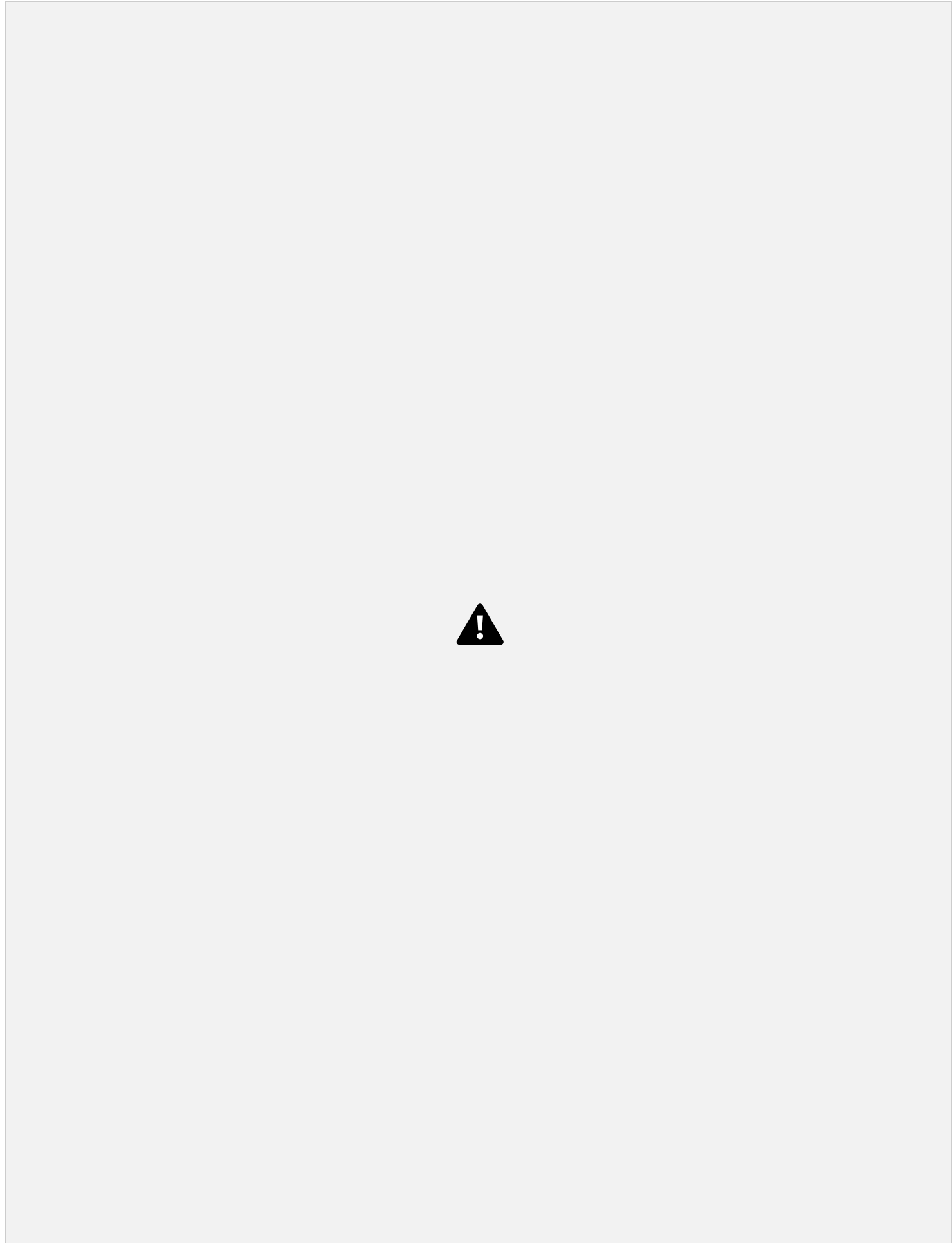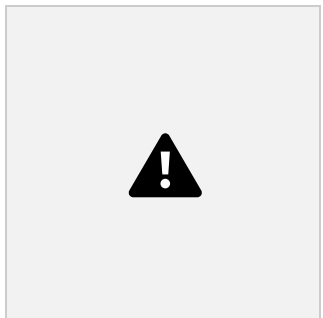
contamination of spices ⚠ At

least   Five countries — including Singapore, Hong ~~Kong and~~ the U.S. — have announced an investigation into possible contamination of spice mixes sold by Indian brands, MDH and Everest. The complaints cite the presence of ethylene oxide (EtO), a toxic chemical used as a food stabilizer, beyond permissible limits.

The Spices Board of India in response has initiated mandatory testing of products shipped abroad and is reportedly working with exporters to identify the root cause of contamination.

Ethylene oxide is an organic compound with the formula C_2H_4O.

It is a cyclic ether and the simplest epoxide: a three membered ring consisting of one oxygen atom and two carbon atoms.

Ethylene oxide is a colorless and flammable gas with a faintly sweet odor
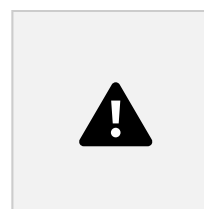
⚠

SPICES BOARD OF INDIA

Spices Board was constituted on 26th February 1987 under the Spices Board Act 1986 (No. 10 of 1986) with the merger of the erstwhile Cardamom Board (1968) and Spices Export Promotion Council (1960). Spices Board is one of the five Commodity Boards functioning under the Ministry of Commerce & Industry.

It is an autonomous body responsible for the export promotion of the 52 scheduled spices and development of Cardamom (Small & Large).

⚠

Main Functions ⚠ Research, Development and Regulation of domestic ~~marketing of~~ Small & Large Cardamom

Post-harvest improvement of all spices

Promotion of organic production, processing and certification of spices

Development of spices in the North East

Provision of quality evaluation services
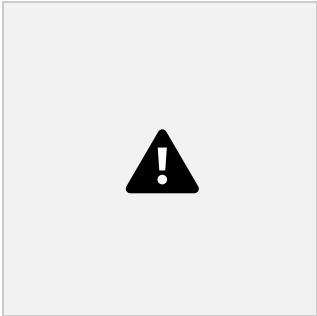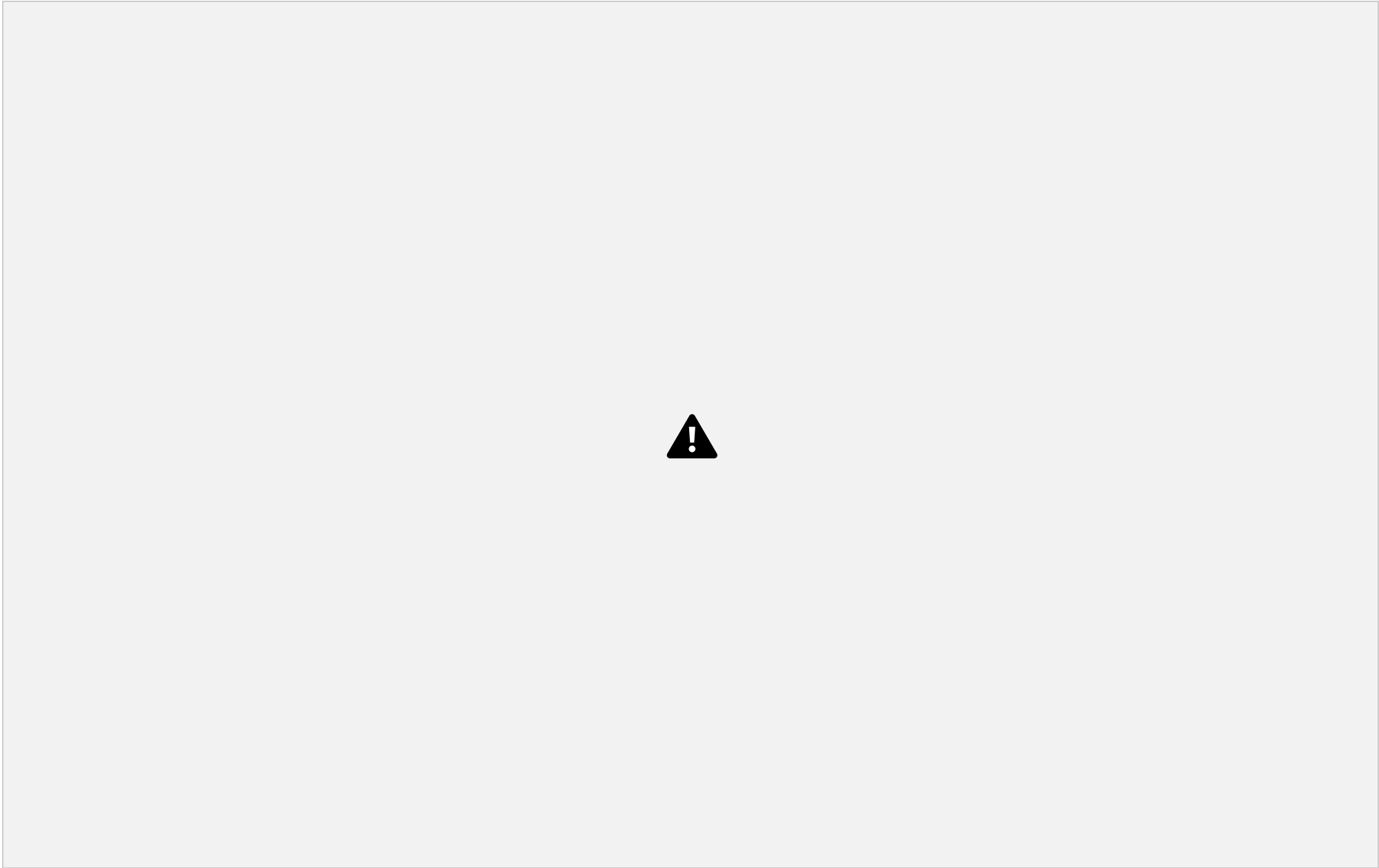
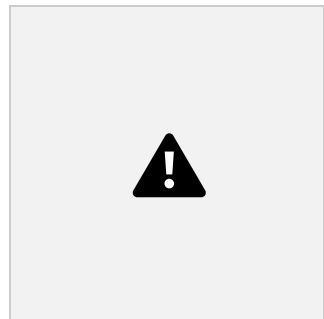Export promotion of all spices through support for:-
Technology upgradation.

Quality upgradation

Brand promotion

Research & product development

Venture capital (VC)

Venture capital (VC) is a form of private equity and a type of

financing for startup companies and small businesses with long-term growth potential.

Venture capitalists provide backing through financing, technological expertise, or managerial experience. VC firms raise money from limited partners (LPs) to invest in promising startups or even larger venture funds
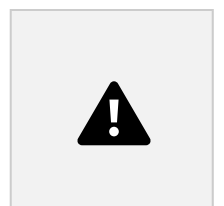
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