# **Green Crackers**

# **□1. What are Green Crackers?**

#### Definition:

Green crackers are **environmentally improved firecrackers** developed by the **Council of Scientific and Industrial Research - National Environmental Engineering Research Institute (CSIR-NEERI)**.

They are designed to **reduce emissions** of harmful gases, particulate matter, and noise levels.

### Objective:

Aspect

To balance **traditional festive celebrations** with **environmental safety** and public health concerns.

Green Crackers

### ? 2. Chemical Composition

Nopeet	Conventional Clackers	Green Cruckers
Key oxidizer	Barium nitrate (toxic)	Removed
Substitutes used	-	Potassium nitrate, strontium
		salts, iron oxide, zeolite
Heavy metals	Aluminium, copper (cause	Reduced or replaced

Conventional Crackers

metallic smoke)

metanic smoke)

Soot & residue High Lower due to zeolite and controlled combustion

- Zeolite acts as an absorbent for particulate matter and toxic gases.
- The controlled oxidation process reduces the formation of PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>x</sub>.

## **□**B. How Do Green Crackers Work?

- They use a **modified combustion process** with:
  - Lower oxidation temperature
  - Controlled release of energy and gases
- This ensures:
  - 30-40% reduction in emissions of PM₂.₅, SO₂, and NOҳ
  - Lower noise levels (within permissible limits)

Cleaner and safer smoke output

# **□**[4. Variants of Green Crackers (Developed by CSIR-NEERI)

Variant Full Form Key Feature

**SWAS** Safe Water Releaser Releases water vapor & air

as dust suppressants; no potassium nitrate or sulphur

STAR Safe Thermite Cracker Uses thermite reaction with

reduced metal content

SAFAL Safe Minimal Aluminium Uses less aluminium to

reduce sound intensity &

metallic emissions

Each variant carries a QR code to verify authenticity and CSIR-NEERI certification.

# **□□5. Legal & Regulatory Framework**

- Supreme Court (2018):
  - Allowed only green crackers to be sold and used.
  - Imposed time limits for bursting crackers during festivals.
- Pollution Control Boards (CPCB/SPCB):
  - Mandated emission compliance and labelling norms.
- Monitoring:
  - QR codes help trace manufacturers and prevent counterfeit products.

### **□[6. Environmental Significance**

- 1. Air Pollution Reduction:
  - 30–40% lower emissions of PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>2</sub>
  - Reduced smog formation post-Diwali
- 2. Noise Pollution Control:
  - Noise limited to 110-125 dB, as per CPCB norms

#### 3. Health Benefits:

Decreased respiratory issues, especially for children and elderly

### 4. Sustainability Link:

 Supports India's Net Zero 2070 and National Clean Air Programme (NCAP) goals

#### 5. Economic Balance:

 Preserves livelihood of traditional fireworks manufacturers through eco-transition, rather than total ban

### □□□7. India's Global Role

- India is the first and only country with a government-backed "Green Crackers" programme.
- CSIR-NEERI's model is being studied globally for **sustainable pyrotechnics**.

### **□**[8. Challenges & Limitations

• Partial Pollution Reduction:
Green crackers are less polluting, not pollution-free.

### Implementation Gaps:

- Limited public awareness
- Counterfeit products without NEERI certification
- Weak enforcement of sale & use restrictions

### Testing & Availability:

Limited testing infrastructure for small manufacturers

### ☐ 9. Way Forward

- Strengthen **certification and QR verification** mechanisms.
- Promote **public awareness campaigns** about safe use.
- Encourage research into zero-emission fireworks.

 Integrate green fireworks into Make in India and sustainable industry policies.

## **□□10. UPSC Relevance**

Mains (GS Paper 3)

**Essay Paper** 

Exam Type Possible Question

**Prelims (Science & Environment)** "Green crackers" are developed by which

institution? / Which of the following

chemicals are absent in green crackers?

Discuss the significance of green crackers in

balancing cultural traditions with

environmental protection.

"Technology for Sustainable Celebrations:

The Case of Green Crackers."

## **□**Summary in Simple Terms

Green crackers are **eco-friendly versions** of fireworks made by **CSIR-NEERI** to cut down harmful emissions and noise.

They replace toxic chemicals like barium nitrate with safer compounds, emit 30-40% less pollution, and come with QR-coded certification.

Though not completely clean, they are a **significant step toward sustainable festive traditions** in India.

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