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## First Report of *Lysurus cruciatus* var. in Odisha (Eastern Ghats, India)

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Often referred to as the "lizard's-claw stinkhorn", *Lysurus cruciatus* is an intriguing member of the Phallaceae family of fungi. It is distinguished by its unique fruiting body, which is a tall, crimson, latticed structure that rises from a base that resembles an egg. A slimy, foul-smelling spore mass covers the eye-catching lattice-like framework, which is intended to draw flies and other insects that aid in the spores' dispersal. To maintain gleba on lateral surfaces, *Lysurus cruciatus* (Phallomycetidae, Phallaceae) creates a basidiome with a long receptacle that ends in conical arms that branch initially and unite at their endpoints. The fruit body's larger receptacle allows it to stand upright. A topic of fascination for both mycologists and nature lovers due to its peculiar shape and potent scent. *Lysurus cruciatus*, this paper reports new record from the Eastern Ghats of India.

**Keywords** : Eastern Ghats, *Lysurus cruciatus*, Odisha, Phallaceae, India

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### INTRODUCTION

A unique species of stinkhorn fungus that is a member of the Phallaceae family is *Lysurus cruciatus*. It stands out for having an unusual fruiting body that quickly develops from a structure that resembles an egg and is partially hidden in the ground. In a cruciform (cross-shaped) or star-like pattern, the mature fungus has four to six thin, reddish to pinkish arms that curl upward and outward. In addition to drawing flies and other insects that facilitate spore distribution, the potent smell resembles decomposing organic materials.

*Lysurus cruciatus* is a saprobic plant that grows best in tropical and subtropical climates in nutrient-rich soils, decomposing wood, or organic waste. Widely found in Africa, Asia, Australia, and the Americas' tropical and subtropical regions. In

Europe, it is first introduced. It is an odorous specimen. French botanists François Mathias René Leprieur and Camille Montagne gave it its first scientific name, *Aserophallus cruciatus*, in 1845. In 1902, German mycologist Paul Christoph Hennings moved it to the *Lysurus* genus. Originally identified as *L. wocoodii*, the USA later gave it the common name "lizard's claw stinkhorn" (Arora, 1986). Short columnar arms linked to the apical margin of a cylindrical receptacle that emerges from a ruptured peridium are the physical characteristics of the tropical genus *Lysurus*, which is saprobic (Schaffer, 1975; Lodge and Cantrell, 1995). The spores are found in a dark, foul-smelling slime called gleba that coats the inside of these hollow, spongy limbs. The gleba, which is located on the lateral surfaces of receptacle arms (Miller *et al.* 1991, Beltrán-Tejera *et al.*, 1998; Cortez *et al.* 2011), emits a fetid odor (Burk *et al.* 1982). There is very little research on Phallucene's relationship to the

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formation of basidiomas in India because the majority of earlier publications concentrated on documentation, and there are no much reports of *Lysurus* species from India (Jamaluddin *et al.* 2004; Abrar *et al.* 2012). Its distinct form and ecological approach make it an intriguing topic for mycologists and fungal ecologists to research.

## MATERIALS AND METHOD

From a location in the Boundary of Chandaka Forest, Odisha, *L. cruciatus* primordia and successively matured basidioma were gathered (Fig.1). Fresh material observations were used to describe macroscopic features; Kornerup & Wanscher's color notations are from 1981. Pfeiffer's solution, which contained 40% formalin (w/v) and absolute methanol in equal amounts, was used to fix the primordia from various stages. Every measurement was performed in 3% KOH. Primordial free-hand slices stained with 1% phloxine and 1% lactophenol cotton blue were placed on glass slides and viewed under an optical and stereo microscope. The Odisha Biodiversity Board, Government of Odisha, is where the samples were provided for herbarium.

### Study area

An interesting mushroom species was studied from the Outskirts of Chandaka Wildlife Sanctuary (20° 21' 03" N and 85° 40' 03" E; Geo URI-geo:20.35,85.666667), Bhubaneswar under Khordha district in Odisha, India. Odisha is one of the States of India. It is located between the parallels of 17.49'N and 22.34'N latitudes and meridians of 81.27'E and 87.29'E longitudes. It is bounded by the Bay of Bengal on the east; Chhattisgarh on the west and Andhra Pradesh on the south.

*L. cruciatus* is the reporting species. Egg is  $\sim 37 \pm 2$  mm in diameter having subglobose or globose shape and it is attached to the soil with the help of numerous mycelial cords. Outer layer is thin and membranous while the inner membrane is thick and ropy. Pseudostipe, soft, pale white and connected to the egg. It is  $\sim 100 - 125 \pm 3$  mm long,  $\sim 12 - 18 \pm 1$  mm in diameter near to the egg at the base and  $\sim 29 - 38 \pm 2$  mm in diameter at the base of the arms. Arms, 9 in number and  $\sim 53 - 82 \pm 3$  mm long.

## Morphological Features of *Lysurus cruciatus*

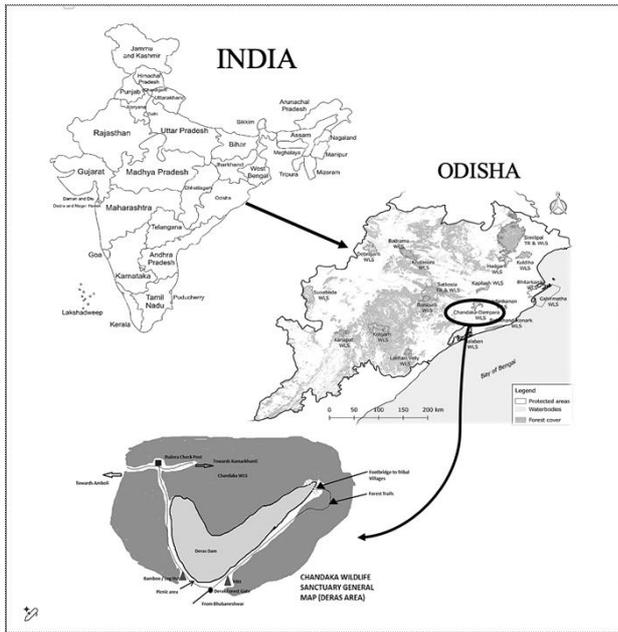
- ❑ Egg Stage (Immature Stage) :The fungus begins as a subterranean or partially buried "egg". The egg is spherical to ovoid, whitish to pale gray, and surrounded by a gelatinous layer. Inside the egg, all components of the mature fruiting body are performed.
- ❑ Pseudostipe (Mature Stage):Once mature, the Pseudostipe rapidly emerges from the egg, often in a matter of hours.
- ❑ Arms (Lobes):The most distinctive feature. 9 slender, upright, cruciform (cross-shaped) or stellate (star-shaped) arms. Arms are hollow, spongy, gray to black in color. They emerge from the top of the egg and curve outward and upward as the Pseudostipe elongates. The inner surfaces of the arms are coated with gleba.
- ❑ Gleba: A dark olive to brownish slime, very foul-smelling. Found on the inner surface of the arms. Contains the spores and attracts flies and other insects that help disperse the spores.

## Phylogeny

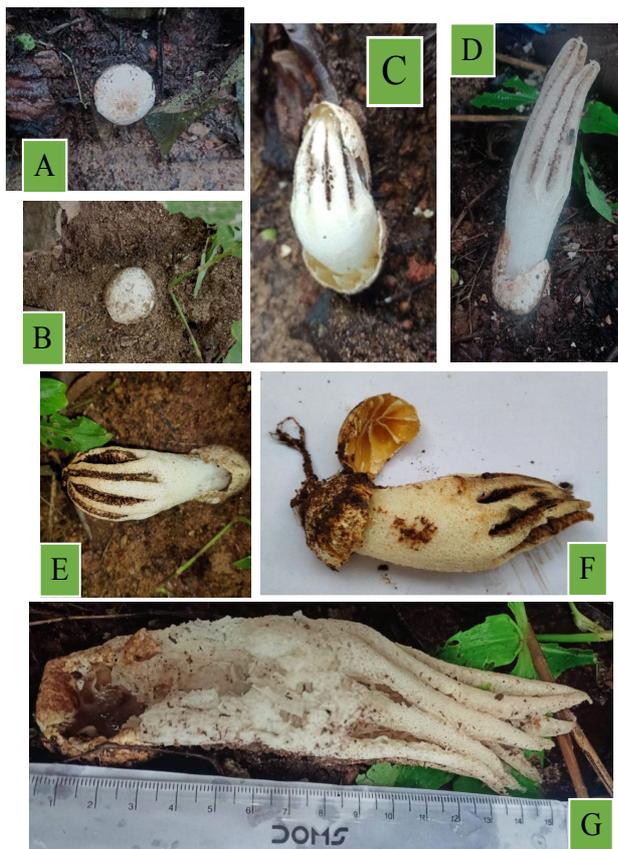
- ❑ Egg is 40 mm in diameter having globose shape ..... *Lysurus fossatti*.
- ❑ Arms are over outed and outer surface is smooth having size 60-100 in mm ..... *Lysurus mokusin*.
- ❑ A very strong odour containing species which attracts insects..... *Lysurus periphragmoides*.

## RESULTS AND DISCUSSION

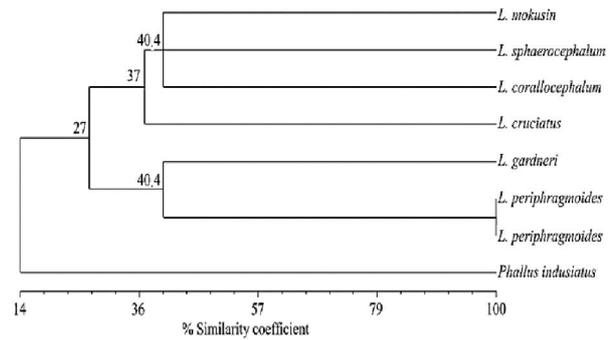
Throughout the past century, phalloid morphology and taxonomy have been extensively investigated, but their developmental characteristics have hardly been looked at (White, 1944; Flegler and Hooper, 1980; Sáenz *et al.*, 1983; Abrar *et al.* 2007). Like many other fungi in the Phallaceae family, *Lysurus* species produces a range of bioactive secondary metabolites, although there aren't as many studies specifically on this species as there are



**Fig 1:** The above mention map indicates the location of Chandaka Wildlife Sanctuary near to which the *Lysurus cruciatus* species sample was recorded



**Fig. 2:** **A and B.** The egg stage of *Lysurus cruciatus* var.; **C.** Initial sprouting of Pseudostipe from the egg; **D and E.** Completely developed stage of *Lysurus cruciatus* var.; **F.** Mature sample of *Lysurus cruciatus* var. scoleted for taxonomical and morphological study; **G.** Reading different morphological data from outer and inner section of *Lysurus cruciatus* var..



**Fig 3:** Dendrogram of *Lysurus* species using SAHN (Sequential, Agglomerative, Hierarchical, Non-overlapping) method with Unpair Group with Arithmetic Mean parameter. Relationship is expressed as similarity coefficient (Ekowati *et al.* 2011; Khan *et al.* 2011; Hermawan *et al.* 2021). Phallaceae is a family of fungi and known as stinkhorn family. This family contains 21 genus and 77 species, *Lysurus* is a genus of this family.

on more widely researched fungi. The ecological function and reproductive strategy of *L. cruciatus* are largely linked to the metabolites it produces. Methyl mercaptan, dimethyl disulfide, and other sulfur-containing chemicals are among the volatile organic compounds (VOCs) that give the gleba its distinctive scent (Kakumyan *et al.* 2019; Hou *et al.* 2023). The gleba releases a strong fetid stench to attract insects for spore dispersal. These volatiles have insect-attracting qualities in addition to simulating the smell of decomposing organic materials. There are also currently few in-depth investigations specifically focused on the *Lysurus* species antibacterial action (Cortez and Rossoni, 2014; Shen *et al.* 2024). It is thought to produce bioactive substances that prevent the growth of some bacteria and fungi, just like other members of the Phallaceae family. The gleba and other fungal tissues may include secondary metabolites, such as phenolic chemicals, terpenoids, and sulfur-containing volatiles, which are probably responsible for antimicrobial effects. In the fungus’s native environment, which is abundant in decomposing organic matter, these compounds might serve as a defence mechanism against microbial rivals.

**DECLARATION**

Conflict of Interest. Authors declare no conflict of interest.

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