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# First record of the occurrence of *Pleurotus citrinopileatus Singer* on new hosts in Kenya

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**ABSTRACT**

The occurrence of the edible basidiomycete *Pleurotus citrinopileatus* is reported for the first time in Kenya. The mushroom was collected from the dead logs and branches of *Antiaris toxicaria* (Pers.) Lesch.*, Polyscias fulva*(Hiern) Harms*, and Ficus thoningii* Bl. in Kakamega forest. These trees are indigenous and are new hosts for this species. This mushroom is used as food by local communities in Kenya but it has not been documented nor studied. It is used solely as a product of the wild. People collect it and prepare it traditionally with other foods for consumption.

**Keywords**: *Pleurotus citrinopileatus***,** first record, occurrence, new hosts, Kenya

## INTRODUCTION

Mushrooms represent an important biological resource of social, economic and ecological significance (Labarère and Menini, 2000). Most of the mushrooms, which are used as food by local communities in Kenya have neither been documented nor studied.

These indigenous mushrooms are used solely as products of the wild. People collect wild mushrooms and prepare them traditionally with other foods for consumption.

The most popular mushrooms collected being the *Termitomyces* species commonly growing in the open fields and farms. Palapala *et al.*, (2006) reported the occurrence of three native strains of *Auricularia auricula* (L. ex Hook.) Underw. in Kakamega forest in Western Kenya. There are no records or reports on *Pleurotus* species in Kenya. These native strains are faced by threats of depletion due to over harvesting for consumption by the rural populace. To our knowledge, this is the first report on one interesting species of *Pleurotus* mushroom collected from Kakamega forest.

Species of the genus *Pleurotus* are important mushrooms because of their ease of cultivation, their nutritional value, and their medicinal properties ( Lewinsohn *et al.*, 2005). Traditional medicine attributes medicinal properties to *Pleurotus* spp. Scientific evidence supports their importance as producers of substances with antibiotic, antitumor, anti-inflammatory, and hypo-cholesterolaemic activities (Lewinsohn *et al*., 2005). The work presented in this paper is a preliminary investigation of an indigenous edible species of *Pleurotus* mushroom from Kakamega forest.

## MATERIALS AND METHODS

**Study Site:** Kakamega Forest is a tropical rainforest located in Western region in Kenya, and lies between latitudes 00008'30.5'' N and 00022'12.5''N and longitudes 34046'08.0''E and 34057'26.5''E at an altitude between 1500m and 1700m. The forest covers an area of about 240 $Km^2$ out of which about 10% is plantation forest while the rest is under natural forest. The forest is currently sub-divided into three parts, each managed by a distinct authority and each using a different approach of management (Guthiga *et al.*, 2008).

**Sample collection:** Mushroom samples were collected during rainy seasons between October, 2008 and May 2011. Sample collection protocol for macro fungi outlined by Mueller *et al.*, 2004 was used in this study. Since the focus was on one group of mushrooms-*Pleurotus*, opportunistic sampling protocol was used. That is, sample collection was done only in those sites where these fungi were most likely to occur.

**PLATE 1: Indigenous *Pleurotus citrinopileatus* mushroom growing on dead wood of *Antiaris toxicaria* in Kakamega forest.**

Sporocarps exhibiting a range of developmental stages were examined for morphological characters and measurements in the forest. Tissue cultures were taken and spore prints set up. The specimens were preserved in aluminium foil and packed in paper bags for later identification according to the method by Lorge *et al.*, 2004. Fruit bodies were identified and counted according to the method outlined by Straatsma, 2001.

**Ex situ cultivation of the mushroom:** Starting cultures were obtained from the living mushroom fruit bodies of selected *Pleurotus* spp using the standard tissue culture techniques outlined by Stamets (2000).

Procedure by Isikhuemhen *et al.* (2000) was followed with slight modification when preparing mushroom spawn. To obtain fresh basidiomata to complement the study of the macro- and micromorphology, traditional methods for fruiting species of *Pleurotus* were used (Stamets 1993). A mixture of wheat straw (50%) and sugarcane bagasse (50%) were chopped using a chaff cutter, wetted and allowed to drain on cemented floor overnight. The mixed substrate was then pasteurized at 70°C for 1 hour in an improvised pasteurizer. After cooling they were poured on clean and sterilized heavy duty polythene (48X100g) and spawned at rate of 5%. The spawned substrate was introduced into 58.5 X73.5 cm non perforated (gauge 150) polypropylene bags incubated in the dark at 25° C. After 10days, bags were kept in mushroom growing room at 23±2C with 12h light/12 h dark photoperiod to induce basidiome formation.

Other substrates such as wheat straw alone, sugarcane bagasse alone and rice straw alone were tried in this study. They all worked. None of the above mentioned substrates failed to produce the basiodiomata of *P*.citrinopileatus.

## RESULTS AND DISCUSSION

**Taxonomic position and characteristic of *P.citrinopileatus* in its natural habitat**
*P.citrinopileatus Singer* belongs to Kingdom Fungi, Division Basidiomycota, Order Agaricales and Family Pleurotaceae.

This mushroom was found growing naturally in Kakamega forest on the dead logs and branches of indigenous trees namely *Antiaris toxicaria*(Pers.) Lesch. (Moraceae,*Polyscias fulva*(Hiern) Harms (Araliaceae),*Ficus thoningii* Bl. (Moraceae), which represents new host for this species.

**Description:** Ecology: Saprotrophic: growing in shelf-like clusters on dead logs and twigs of *Ficus thoningii, Polyscias fulva* and *Antarias toxicaria*

Cap: diameter 10-15 cm and width-15-19cm; convex, becoming flat or somewhat depressed; fan-shaped, somewhat greasy when young and fresh; smooth; yellowish; the margin entire when young, later wavy.

Basidiomes were large, fleshy, solitary to imbricate, flabellate to dimidiate.

Aged fruits-were squamulose.

Stem short, solid, eccentric-length=1.5cm and width=1.5cm.

Lamellae decurrent, light-colored, thin to broad, margin entire. These features can be seen in Plate 3.

Spores were thin-walled, smooth, and cylindrical to sub cylindrical in shape, 7.5-9.0x 3.0-3.5µm.

The pileipellis was acutis. There was no pileocystidia.

There was a well developed subhymenium

Pileus: golden yellow, veil absent. And stipe: eccentric. These features can be seen in Plate 2.

Clamp connections were present.

Hyphal system: monomitic.

Spore print: whitish to cream

Specimens exhibited great morphological uniformity, observed not only in collections from nature but also in fruit bodies obtained in culture. These can be seen by comparing the image on Plate 1 and that on Plate 5.

**PLATE 2: The upperside of *Pleurotus citrinopileatus* when harvested from the forest**

**PLATE 3: The underside of *Pleurotus citrinopileatus* showing the presence of gills**

*P. citrinopileatus* was found mainly in the Buyangu reserve of the Kakamega forest and collected only once in the Yala reserve. Distribution of *P. citrinopileatus* was not uniform all over the explored territory; in some instances very small populations on isolated individual dead logs or branches were observed, while in other cases the populations were large, with a high number of individuals occupying a range of fallen and rotting logs. A total of 8 accessions of *P. citrinopileatus* were collected representing variability present in the area.

**PLATE 4: *Pleurotus citrinopileatus* on Potato Dextrose Agar (PDA) after an incubation period of 10 days.**

**PLATE 5** ***: Pleurotus citrinopileatus*** **ready for harvesting (they were grown on wheat straw (50%) and sugarcane bagasse(50%) substrate)**

During the field studies, one interesting species of *Pleurotus* mushroom was recorded for the first time from Kakamega forest in Kenya namely *Pleurotus citrinopileatus* Singer. Stamets (2000) reported that this species is only found in Asia and have never been found growing in the wild in North America or elsewhere.

*P. citrinopileatus* Singer was isolated from the dead logs and branches of indigenous trees namely *Antiaris toxicaria*(Pers.) Lesch. (Moraceae*,Polyscias fulva*(Hiern) Harms (Araliaceae)*,Ficus thoningii* Bl. (Moraceae), which represents new hosts for this species. Stamets (2000) had reported this mushroom as a saprophyte of Asian hardwoods especially oaks, elm, beech and poplars.

This species forms clusters hosting a high number of individual mushrooms, whose stems often diverge from a single base. This observation concurs with Stamets (2000).The latter mainly occurs in the eastern Asia, and has similar morphological characters with the former.

Our knowledge of mushrooms isolated from protected areas is inadequate, yet this is critical in understanding their biotechnological application potential. A recent review (Torsvik *et al.*, 2002) on the microbial diversity in various soil environments and sediments suggested that microbial diversity is higher in forest and pasture soils than in arable soils. National parks and reserves offer an undisturbed habitat for isolation of novel microorganisms for screening of beneficial natural products (Tinatin and Nurzat, 2006).

*Pleurotus* species growing inside the Buyangu reserve of the Kakamega forest are still safe, however, the slow regeneration of these species and increasing human intervention around the reserve area are the causes of serious concern.

Conservation of *Pleurotus* mushrooms genetic resources needs urgent attention so as to protect the existing genetic diversity and to promote cultivation of rare and endangered species that are of great relevance in socio-economical structure of local people of Kakamega area.

Ecological and biotechnological features of the *Pleurotus* mushrooms in the natural ecosystems of national parks and reserves of Kenya remain almost unexplored. This investigation is part of an ongoing research programme to characterize and domesticate *Pleurotus* species from Arabuko Sokoke and Kakamega forests in Kenya with potential application in food production.

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