



## On the off season survival of *Ustilaginoidea virens*, the pathogen causing false smut of rice in Kerala

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### Abstract

*False smut disease of rice caused by Ustilaginoidea virens (Cke.) Tak. is an emerging disease worldwide affecting the yield and quality of rice. The pathogen survives as dormant structures such as sporeballs, chlamydospores, sclerotia etc. in soil, stubbles of the crop and on collateral hosts. The disease being a major constraint of rice production in Kerala, surveys were conducted to study the off season active survival of U. virens in the field. During the survey conducted at Palakkad, the pathogen was found to be surviving on the ratoon rice plants of variety Uma emerged from the stubbles of the previous crop at Kizhayur area of Palakkad. From Ambalappuzha area of Alappuzha district, the disease was observed on weedy rice, Oryza spontanea.*

**Keywords-** Rice false smut, *Ustilaginoidea virens*, off season survival, ratoon from stubbles, *Oryza spontanea*

### I. INTRODUCTION

False smut disease of rice caused by *Ustilaginoidea virens* (Cke.) Tak. is an emerging disease worldwide (Brooks *et al.*, 2009) and is found to affect the rice yield and quality in Asia (Zhou *et al.*, 2008). Apart from yield reduction, the pathogen causes qualitative losses and health problems as well (Seshavatarm, 1965; Nakamura *et al.*, 1994 and Parsons *et al.*, 2001). False smut was once considered a minor disease but has become a serious problem in the last few decades due to high input cultivation, adoption of high yielding varieties, climate change etc. (Anders *et al.*, 2008; Lu *et al.*, 2009). In Kerala state of India, this has emerged as a serious problem in recent years causing up to 75 % yield losses (Rashmi *et al.*, 2014).

The false smut pathogen *U. virens* (Cooke) Takahashi, is an ascomyceteous fungus, the perfect stage being *Villosiclava virens* (Nakata) E. Tanaka & C. Tanaka (Tanaka and Tanaka, 2008). The pathogen survives as dormant structures such as sporeballs, chlamydospores, sclerotia etc. in soil, stubbles of the crop and also in collateral hosts (Singh and Dube 1976; Yashoda and Anahosur, 2000). The collateral hosts aid in the off season active survival of the pathogen. The reported collateral hosts of *U. virens* include *Oryza officinalis*, *Digitaria marginata*, *Panicum trypheron*, *Echinochloa crus-galli*, *Imperata cylindrical* etc. (Rao and Reddy, 1955; Shetty and Shetty, 1985; Shetty and Shetty, 1987; Atia, 2004). There were no previous studies on the off season survival of *U. virens* in Kerala. The disease being a major constraint of rice production in the state, a study was conducted to throw light on the off season active survival of *U. virens* in the field.

### II. MATERIALS AND METHODS

A total of four surveys were conducted for two consecutive years during 2012-2013, two each at Palakkad and Alappuzha districts, the major rice growing tracts of Kerala. In the course of each

survey, thirty rice growing areas were surveyed for assessing the incidence of false smut disease. During the surveys common graminaceous grasses and sedges in the rice fields like *Echinochloa colona*, *Echinochloa crusgalli*, *Digitaria longifolia*, *Leersia hexandra*, *Fimbristylis milliacea*, *Cyperus rotundus*, weedy rice etc. were observed for the presence of false smut disease. Observations were made on any other modes of active survival as well.

### III. RESULTS AND DISCUSSIONS

During the survey conducted at Palakkad in the year 2012, the pathogen was found to be surviving on the ratoon rice plants of variety Uma emerged from the stubbles of the previous crop at Kizhayur area of Palakkad (Figure 1). An average of one to seven grains of a panicle had got converted in to smut balls. In the whole area, most of the rice plants emerged from stubbles were found to be affected by the disease. The finding indicates that the stubbles of the previous crop when left unattended, there is chance of active survival of the pathogen on the plants emerging from the stubbles especially in areas receiving distributed rainfall throughout the year. Nessa *et al* (2015) recorded rice false smut disease on the re-generated tillers (otherwise known as ratoons) in the harvested hills that were previously infected by the disease from Bangladesh.

The survival of the pathogen under the field conditions on collateral hosts observed during the surveys showed most of the weed plants to be free from infection by *U. virens*. From Ambalappuzha area of Alappuzha district, the disease was observed on weedy rice, *Oryza spontanea* (Fig 2). The symptom observed was similar to the one observed in the cultivated rice. In place of normal grains, yellow coloured pseudosclerotia were formed which were about double the size of normal grains. Rao and Reddy (1955) reported false smut disease on *Oryza officinalis* from India. The disease has been reported on the male inflorescence of *Zea mays* and on wild species of *Oryza* (Mulder and Holliday, 1971). Shetty and Shetty (1985) reported *Digitaria marginata* as the collateral host of *U. virens* from Dakshina Kannada district of Karnataka. False smut was also observed from India on *Panicum trypheron* (Shetty and Shetty 1987). During surveys conducted by Abbas *et al.*, (2002) in Stoneville, Mississippi, 32 of 1280 commercial and inbred maize hybrids were found to have false smut infection on the tassel. *Echinochloa crus-galli*, and *Imperata cylindrica* are the other reported collateral hosts of *U. virens* (Atia, 2004).

The results of the study indicate that ratoon rice and weedy rice have some role to play in the off season active survival of the false smut pathogen, *U. virens* in Kerala. To our best knowledge, this is the first report regarding the off season survival of *U. virens* on *O. spontanea* and ratoon rice emerging from stubbles of previous rice crop, from Kerala, India.



*Fig 1. False smut disease on ratoon rice emerged from the stubbles of the previous crop*



*Fig 2. False smut disease on Oryza spontanea*

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