Panicle Mite, Steneotarsonemus spinki Smiley (Acari: Tarsonemidae): A Silent Menace Undermining Rice Production

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ABSTRACT

The panicle mite *Steneotarsonemus spinki* has emerged as an economically important but often overlooked pest of rice, posing a serious threat to crop productivity in different rice-growing regions In India. Owing to its minute size and cryptic habit of colonizing the leaf sheath and developing panicles, infestations frequently remain undetected until significant damage has occurred. Feeding by the mite disrupts panicle emergence and grain development, leading to symptoms such as spikelet sterility, grain discoloration, chaffy grains and overall yield reduction. The pest is also known to aggravate grain quality deterioration through its association with various fungal pathogens and bacteria, further compounding economic losses. Here, this article highlights the growing importance of *S. spinki* as a constraint to sustainable rice production and underscores the adoption of suitable integrated management approaches.

INTRODUCTION

Rice *Oryza sativa* L. is one of the most important cereal crops in Odisha as well as in India, serving as a food for more than 60% of the human population and plays a crucial role in food security. Sustaining rice productivity has become increasingly challenging due to the intensification of agriculture, climate change and the emergence

of new and resurgent pest problems. Among these, the panicle mite *Steneotarsonemus spinki* Smiley (Acari: Tarsonemidae) has gained prominence as a silent but serious threat to rice production in many rice-growing regions (Seni and Mandal, 2021).

It was appeared as a destructive rice pest and become serious from 1997 onwards when it caused 30-90% rice crop loss in Caribbean region. In Sambalpur district of Western Odisha, more than 349 ha area of standing rice had been affected by panicle mites in 2019 (Anonymous 2019). Even in 2025 it also caused lot of damage of *Kharif* rice in Bargarh and Sambalpur districts of Odisha.Unlike conspicuous insect pests, panicle mites are microscopic and remain concealed within the leaf sheath and developing panicles, often escaping early detection. Their feeding activity on meristematic tissues and developing grains interferes with panicle emergence, spikelet development, and grain filling, resulting in symptoms such as chaffy grains, panicle sterility, grain discoloration, and reduced head exertion. In severe infestations, significant yield losses and deterioration of grain quality have been reported, making the pest economically important despite its minute size.

The importance of panicle mite has increased in recent years due to factors such as the adoption of high-yielding and hybrid rice varieties, excessive nitrogen fertilization, increase crop density and indiscriminate use of insecticides that disrupt natural enemy complexes. Moreover, its association with fungal pathogens and grain discoloration further aggravates losses and complicates diagnosis in the field (Rao and Prakash 2002; Hummel *et al.*, 2009). Because damage symptoms often resemble those caused by diseases or physiological disorders, panicle mite infestations are frequently misidentified or overlooked. Given its cryptic nature, rapid population buildup under favourable conditions, and growing geographical spread, the panicle mite has emerged as a major constraint to sustainable rice production. A clear understanding of its biology, host plants, and ecological interactions is therefore essential for developing effective monitoring and management strategies.

Distribution

Currently *S. spinki* is present almost all the major rice producing countries in the World. In India, it is present in Odisha, Andhra Pradesh, Chhattisgarh, West Bengal, Karnataka, Gujrat, Uttar Pradesh and Jharkhand.

Host Plants

Rice is the major and preferred host of *S. spinki*, besides the rice, they are occasionally found in the leaf sheaths of some graminaceous weeds. In India, weeds, *Schoenoplectus arficulatus*, *Cyperus iria* (Cyperaceae) and *Cynodon dactylon* (Poaceae) were observed as alternate hosts of panicle mite.

Biology

Adult female could lay 50-70 eggs in their life span with an average of 30±3.4 eggs. However, a single female could lay 7-15 eggs per day. Female laid their eggs in cluster. The oviposition period is 5 days. The eggs hatch in 2-4 days and there is an active larval stage lasting about 1 day and a quiescent stage lasting 2 days. The life cycle is completed in 6 days. However, the duration of different stages and the total duration of the life cycle is highly dependent on weather condition prevail on that region.

Ecology

In India it was reported that incidences of this mite were more prevalent during wet season than dry season. During off season adults were found in left over rice stubbles and ratoon

crops. Among ratoon crops, mite populations were more in the medium land irrigated condition than in rainfed fields. It is observed that cloudy weather along with low rainfall prevailing for 4-7 days during flowering period of rice plant were responsible for more invasion of these mites along with the other plant pathogens.

S. spinki associated plant pathogen

It was observed that *S. spinki* is associated with many plant pathogens viz. bacteria, fungi, spiroplasma and virus like particles. In India, many pathogenic fungi and bacteria were isolated from panicle mite infested plants such as *Alternaria padwickii*, *Burkholderia (Pseudomonas) glumae*, *Curvularia lunata*, *Fusarium graminearum* and *Fusarium moniliforme* (Rao and Prakash 2003; Hummel et al. 2009).

Damage and effect on production

Both nymph and adult mite causes damage rice plant by perforating the epidermal cells by their stylets. Mite causes histological injury of the rice plant by destruction of cells of the adaxial epidermis, disintegration, color change, hypertrophy in the mesophyll cells, as well as color change in the abaxial epidermis (Jaimez-Ruiz et al., 2015).

Rao and Das (1977) reported that the infested plants showed poorly exerted earheads and brown lesion leaf sheaths. Beside this, affected glumes had brown to black lemma and palea and shriveled ovary. Rao et al. 1999 observed that deterioration of the grain quality was recorded to be more in the short duration varieties as compared to medium and long duration varieties.

Management

Mites spread to other plants by air current, water (irrigation water and rain), insects, human clothes and the equipments used during rice cultivation especially during harvesting period. Different pathogenic fungi i.e. *Acrocylindrium oryzae*, *Fusarium moniliforme*, *Alternaria padwickii*, *Fusarium graminearum* facilitate the multiplication of rice mites by serving as food. The different management practices which should be followed in infested areas are given below:

Regular field monitoring from maximum tillering stage to flowing stage is necessary.

A. Cultural practices

- Use resistant/tolerant varieties: Clean, certified resistant rice varieties should be used for planting.
- Plant density: High rice planting density favors the higher mite multiplication so, avoid close spacing between row to row and plant to plant.
- Clean cultivation: Removal of stubbles after harvest and destruction of surrounding weed host plants helps to reduce their chances of infestation.
- Crop rotation: Crop rotation with other crop belonging different families' like pulses also reduces the chances of carry over mites to next season.
- Planting time: Same or little deviation of planting time should be followed for rice cultivation in large areas. Staggered planting should be avoided in infested areas.
- Fertilizer application: Do not use more dose of nitrogenous fertilizer and always use them in split doses. Provide adequate potassium and silicon to strengthen plants.
- Proper water management: Avoid prolonged drought and water stress during booting.

- Clean machinery: Thoroughly clean machinery and other equipment after use as they help to disseminate the mites from an infested areas to an un-infested one.

B. Chemical control

Some miticides which are effective against rice mites are Diafenthiuron 50 WP @ 500 g/ha or Fenpyroximate 5 SC @ 500 ml/ha or Spiromesifen 22.9 SC @ 500 ml/ha or Chlorfenapyr 10 SC @ 750 ml/ha.

CONCLUSION

The panicle mite, *S. spinki,* has become a silent yet serious constraint to sustainable rice production due to its concealed feeding habit and late detection of damage. Its infestation leads to poor grain filling, chaffy panicles, and significant quality and yield losses. Intensified cultivation practices, continuous rice cropping, and indiscriminate pesticide use have further aggravated its incidence in recent years. Effective management therefore requires early monitoring, farmer awareness, and adoption of integrated pest management strategies.

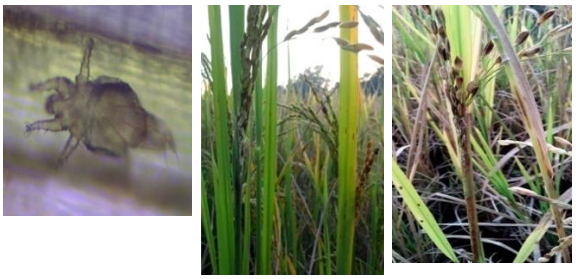

Figure 1. left to right: *Steneotarsonemus spinki* male, *S. spinki* infested rice plant

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