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Association of rice sheath mite (*Stenotarsonemus spinki* Smiley) with grain discolouration disease of rice

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Abstract
Association of sheath mite with *S. spinki* grain discolouration was found positive. Highest per cent discoloured grain and sheath rot was found in combine treatment of mite and pathogen, whereas pathogen *S. oryzae* and mite *S. spinki* alone treatments produce less severity of disease.

Keywords: Fungi, grain discolouration, rice, sheath rot and sheath mite

Introduction
Seed discolouration is one of the most important impediments and reported from all rice growing areas of the world (Dash and Narain 1988). Association of different fungi is considered to be the major cause for different types of discolouration. It reduces seed value and consumption quality of grains. The occurrence of grain discolouration has increase in South Gujarat in mid and late matured varieties since last 10 years and has become major problem in rice cultivation as it reduces quality and quantity of rice production, thus causing economical losses to farmers, traders and consumer. Therefore, the present studies were carried out to identify the association mite with grain discolouration fungi.

Material and Method
To find out the association of rice sheath mite (*Steneotarsonemus spinki* Smiley) with GD the experiment was conducted under the poly house conditions in the pot using cv. Jaya during *Kharif*, 2011. The rice plants were grown in poly house taking care as describe in Pathogenicity test, 3.1.4 in this chapter. The three treatments *viz*; inoculation of pathogen, insertion of live mite infected leaf sheath pieces, and simultaneously inoculums as well as infestation of mite maintaining control without pathogen and mite. The inoculation of pathogen and infestation of mite was done after tillering phase by putting the small (2.0 cm) cut piece of the live mites infested rice leaf after maintaining its population under stereoscopic binocular microscope @ of 8 mite/piece and 5 piece/tiller. Whereas for pathogen *S. oryzae* was inoculated by using single grain insertion technique. For combination treatment of pathogen along with mite was carried out as above simultaneously. Control treatment was kept without mite and pathogen. Five replication and five plants in each treatment was kept for recording observations of mite infestation and rotting of leaf sheath and production of GD symptoms. The result were statistically analyzed and presented.

Result and Discussion
The result revealed that the maximum per cent discoloured grain (50.97%) was found in case of *S. spinki* + *S. oryzae* inoculation, while 27.38 per cent discoloured grain was found in case of *S. oryzae* inoculation. In case of mite infestation 26.25 per cent grain was discoloured. Minimum per cent (5.66%) grain was discoloured in control treatment.
Similarly, and significantly maximum per cent unfilled grain (30.11%) was found in case of *S. spinki* + *S. oryzae* combined treatment which was statistically at par with inoculation of *S. oryzae* (24.12%) followed by infestation of *S. spinki* (20.30%) in case of control treatment negligible per cent grain (6.32%) was found unfilled.
The result of per cent healthy grain was found significant. The lowest per cent healthy grain (18.92%) was found in case of combined treatment of *S. spinki* + *S. oryzae*, while 48.50 per cent healthy grain was found in case of *S. oryzae* inoculation. In case of infestation of *S. spinki* 53.45 per cent healthy grain was found, highest per cent healthy grain (88.02%) was found in control treatment.

The trend was similar in case of lesion length on panicle, maximum length (19.18%) found in *S. spinki* + *S. oryzae* combined treatment, while 9.52 cm lesion found in *S. oryzae* inoculation treatment. In case of infestation of mite treatment 4.15 cm lesion was found whereas no lesions were found in control.

Similar result observed in case of 1000 grain weight. Lowest grain weight (24.23 gm) found in *S. spinki* + *S. oryzae* combined treatment while highest grain weight found in control (32.25 gm) treatment.

Symptoms produce by each treatment was found quite different. The effect of combined treatment of pathogen *S. oryzae* and mite *S. spinki* reduce the panicle emergence. The grain on emerge portion of panicle were stuck to each other, due to reddish brown and dirty white mycelial growth was observed inside as well as out the flag leaf on the glum. The grains were discoloured, shrivel unfilled, healthy appearing grain on top of panicle was of small size. The maximum leaf sheath area 19.18 cm became reddish brown and tissues in the lesion area were found blackish soft.

The inoculation of *S. oryzae* reduced the panicle length (65%), the grains were covered by mycelial mat, the majority of grain in side flag leaf were stuck to each other, they were discoloured, empty; shriveled; whereas few grains on emerged part of panicle appeared filled and healthy but they were small in size. 9.52 cm sheath area became brownish black due to the infection of pathogen. The effect of placing live mite inside leaf sheath, the length of emerged panicle was reduced to more than 75%. The grains inside the flag leaf were unfilled and shrivelled. Whereas, grains on emerged portion of panicle were unfertile, empty having ashy brown colour grain and about 4.15 cm area of sheath became red. The panicle of control treatment had normal length and bear bold healthy seed.

In the present study, in case of combine treatment of mite + pathogen found highest per cent discoloured grain, maximum lesion length and lowest grain weight. It appears that the infestation of mite into sheath facilitated the entry and development of pathogen, which either utilized food which was translocated to panicle-grain.

The finding of Hseih *et al*., (1977 and 1980) [1] showed that inoculation of rice plants with *S. spinki* infected with the fungus *Sarocladium oryzae* resulted in sheath rot diseased plant. Similar result was reported by Chien (1980) [3] that rice plants inoculated with both mite and fungus became more heavily infected than the plants inoculated with either the mite or the fungus. Association of sheath mite with rice GD fungus was also reported by Feng (1980) [4], Rao *et al*., (1993) [6] and Rao and Prakash (1996) [5]. The results of earlier workers are also in agreement with the results obtained in the present investigation.

Table 1: Effect of inoculation of pathogen and infestation of sheath mite (*Steneotarsonemus spinki* Smiley) on rice cv. Jaya

Treatment	% Discoloured grain	% Unfilled grain	% Healthy grain	Lesion length (cm)	1000 grain weight (gm)	Symptoms on panicle
S. spinki + *S. oryzae*	50.97	30.11	18.92	19.18	24.23	Less than 25% panicle length emerges. The mycelium cover grain, most of grain discoloured and shrivelled.
S. oryzae	27.38	24.12	48.50	9.52	28.63	More than 65% panicle length emerge, unfertilized, discoloured, shrivelled grain.
S. spinki	26.25	20.30	53.45	4.15	28.47	Sheath lesion were reddish brown, more than 75% panicle length emerge, unfilled discoloured grain.
Control	5.66	6.32	88.02	0.0	32.25	Panicles fully emerge, bold grain with negligible discoloured grain.
S.Em ±	1.10	2.61	3.92	0.48	0.46	
C. D. at 5%	3.31	7.88	11.76	1.45	1.38	
CV%	8.97	10.18	9.16	11.92	3.63	

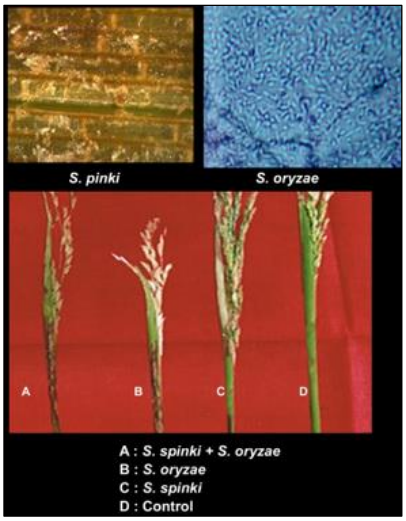

Plate 1: Detach tiller shows the association of sheath mite with grain discolouration

Conclusion

To find out the association of rice sheath mite with GD revealed that inoculation/infestation of pathogen + mite found maximum per cent discoloured grain, lowest grain weight and highest per cent sheath rot infection as compare to inoculation of only mite or pathogen.

It is concluded that sheath infection of fungal organisms and infestation by mite may consumed the food translocated to panicle and finally to seed, resulting into light, discoloured seed. The infestation by mite may provide avenue to organisms for penetration and infection.

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