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SUMMARY

Rice grain discoloration is one of the important diseases occurring in rice growing areas in Nile Delta Governorates of Egypt. It is a constraint of rice grain quality, which reduces the rice acceptability in the markets. The current study was carried out for four successive seasons; 2004, 2005, 2006 and 2007 at plant pathology Laboratory and experimental farm of Rice Research & Training Center (RRTC), Sakha, Kafir El-Sheikh governorate. This study aimed to survey, isolate and identify fungi causing such grain discoloration under field and storage conditions, and to find out an efficient treatment for controlling grain discoloration fungi.

The obtained results could be summarized as follows:-

1. Survey of rice discolored disease, and cultivar susceptibility:

The disease was surveyed from all Governorates. Kafir El-Sheikh Governorate ranked the first in this respect followed by Gharbia Governorate during 2004 and 2005 seasons, Damietta was the lowest infected one.

Giza 177 and Sakha 104 rice cvs. had the highest grain discoloration. On the other hand, Egyptian yasmin and Giza 182 were the lowest infected while Giza 178 and Sakha 101 were moderately infected.

The most frequent fungus causing discoloration was *Alternaria* sp. in both seasons followed by *Fusarium* spp in 2004 and *Nigrospora oryzae* in 2005 season, while *Pyricularia grisea* was the lowest one in two seasons.

2. Isolation and Pathogenicity

Eleven fungi were isolated from discolored grains; *Bipolaris oryzae*, *Bipolaris hawaiiensis*, *Alternaria alternata*, *Alternaria padwickii*, *Curvularia lunata*, *Nigrospora oryzae*, *Sarocladium oryzae*, *Fusarium* spp., *Fusarium moniliforme*, *Aspergillus* sp. and *Penicillium* sp.

Pathogenicity tests showed that *Bipolaris oryzae* was the highest pathogenic fungi followed by *Alternaria padwickii*. and *Curvularia lunata*, while *Aspergillus* sp. and *Penicillium* sp. were the least pathogenic ones.

3. Effect of different media on the linear growth of fungal seed discoloration:

Potato Dextrose Agar was the best medium for growing most of fungi, but Malt Dextrose Agar was the best for *Sarocladium oryzae*, and Banana Dextrose Agar the best for *Fusarium* spp.

Concerning the effect of different media on the sporulation of fungal seed discoloration, the results showed that Potato Dextrose Agar was the best medium for most of fungi, but Czepk's Agar was

the best for *Bipolaris hawaiiensis*. Rice Dextrose Agar was the best for *Alternaria padwickii* and Banana Dextrose Agar the best for *Fusarium moniliforme*.

4. Effect of certain fungicides on linear growth and sporulation of fungal seed discoloration:

All fungicides inhibited the linear growth and number of spores. Beam was the highest effective at all concentrations followed by Vitavax. On the contrary, Dithane M-45 fungicides was the lowest one.

Concerning the sporulation, Vitavax was the highest effective fungicide, followed by Dithane M-45 at 450 ppm. On the contrary, Hinosan was the lowest one at same concentration.

5. Effect of casual fungi, fungicides and their combinations on rice seedling:

The highest seedling infection (89.3%) was induced by *Fusarium moniliforme* followed by *Bipolaris oryzae* (61.8%) and then *Alternaria padwickii* (53.4%). The lowest seedling infection resulted from *Bipolaris hawaiiensis* (33.4%). Adding Vitavax and Beam to the spore suspension reduced the seedling infection, but using Vitavax proved to be better than using Beam. Shoot length was longest when applying Vitavax without any spore suspension, followed by Beam fungicides.

6. Effect of storage periods, nitrogen fertilization levels and type of bags on grain discoloration, seed viability and fungi species occurring in rice seeds:

The percentage of discolored rice grain was higher in the field plots without nitrogen application (zero) or with higher (69 Kg N/fed) nitrogen rate than in that with 23 or 46 Kg N/fed for all cultivars. The lowest discolored grains percentage was obtained under 46 kg N/fed. followed by 23 kg N/fed. Giza 177 had the highest seed discoloration, while Giza 178 had the lowest percentage. The discolored grain increased gradually by increasing storage periods for all cultivars. The highest seed discoloration appeared after eighteen months of storage. Seed discoloration was higher with rice grains stored in striped plastic than in jute sacks for all rice cultivars. On the other hand, the seed germination decreased by increasing storage periods. Giza 178 gave the highest germination compared with Sakha 101 or Giza 177. Seeds stored in jute sacks gave higher germination than those stored in striped plastic especially with increasing storage period. Storage in jute sacks reduced the occurrence of fungi associated with rice grains compared with striped plastic, the highest fungal occurrence was recorded on Giza 177 followed by Sakha 101 and Giza 178.

7. Effect of grain moisture content at harvest on seed discoloration and invasion by storage fungi in different rice cultivars:

The percentage of grain discoloration increased with increasing of grain moisture content and storage period, while the germination percentage decreased. Giza177, and Sakha 104 were the most affected cultivars which had the highest discoloration percentage, greatest number of fungi species and the least germination. Stored fungi species increased with increasing of grain moisture content in all cultivars. *Alternaria*, *Bipolaris* and *Fusarium* spp were the most common fungi prior to storage, while *Aspergillus* and *Penicillium* were the most common fungi after storage for 16 months.

8. Susceptibility of rice cultivars to grain discoloration:

Giza 171 was the highest infected cultivar followed by Sakha 104 and Giza 177 in both seasons. Egyptian yasmin and Hybrid 1 had the least percentage of discolored grains in both seasons. For 1000-grain weight, the discolored grain decreased for all tested rice cultivars compared with the healthy grain weight. The fungal organisms isolated from different rice cultivars during 2005 and 2006 seasons indicated that *Fusarium* spp was the most associated with grain discoloration in two seasons followed by *Alternaria* sp. while *Pyricularia grisea* was the lowest one.

9. Effect of fungicide-seed treatment, fungicide spray and their combinations on rice grain discoloration:

The discolored and unfilled grain percentage decreased by treating with fungicide combined with spraying of Hinosan at booting stage compared with seed treatments by fungicides alone. The best results were obtained by spraying Hinosan two times; at booting and flowering stages. The 1000-grain weight increased by decreasing discolored and unfilled grain percentage in both seasons of the study.

10. Effect of antioxidants and some chemicals on rice grain discoloration:

Using Salicylic acid at 20 mM induced the lowest percentage of discolored grains, unfilled grains and increased the 1000 grain weight in both seasons followed by magnesium tri-silicate, while citric acid induced the highest percentage of grain discoloration.