

SHORT COMMUNICATION

INFLUENCE OF GRAIN DISCOLORATION TO SEED QUALITY

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ABSTRACT

Rice intensification deeply applied has increased chemical fertilizer application and developed more rice seasons yearly. This is one of the causes to increase damage by pests and diseases. Grain discoloration is considered as one of popular problems in Mekong Delta. The biotic stress has extended more severely. Rice varieties were used in the experiments conducted in 2003 winter-spring as: OM1490, ST3, IR64, OMCS2000, Jasmine 85; in 2004 summer-autumn as: OM2008 (glutinous), Jasmine 85, DS-20, OM1490, OM4086, OMCS2000, OM4872, OM3419; in 2004 winter-spring as: OM4086, OM3238, OM2008, OM2395, OM4872, OM4495, OM3536, OM2492, OM4498, OM2718. Experiments were laid out in randomized complete block design with three replications. Germination rate of Jasmine 85 was affected by discoloration disease in two seasons but not to be affected for OM1490. Genotypes OM2008 and OM2395 were noticed to become very susceptible to the disease in 2004 winter-spring. For OM3238, OM4872, OM2718, the disease did not severely infect in 2004 dry season 2004. Beside that, 1000-grain weight obviously decreased due to disease influence. Thus head rice percentage very significantly decreased due to the stress when we compared two treatments of healthful and diseased grains. However, OMCS2000 exhibited the highest disease index of grain discoloration.

Keywords: disease index, disease score, grain discoloration.

INTRODUCTION

Rice is one of the most important cereal crops of the country, especially in Mekong Delta. Rice intensification deeply applied has increased chemical fertilizer application and developed more rice seasons yearly. This is one of the causes to increase damage by pests and diseases. Rice yield loss due to pests and diseases has been noticed more and more seriously. Grain discoloration is considered as one of popular problems in Mekong Delta. The biotic stress has extended more severely. Farmers do not know when diseased grains are sown; rice yield of coming season will decrease due to subsequent influences by the disease. It may lead decreasing of number of filled grains per panicle, 1000-grain weight, and increasing unfilled grain percentage. Grain discoloration is caused by many factors

as *Helmithosporium*, *Cercospora*, *Gerlachia*, *Fusarium*, *Phoma*, *Curvularia*, *Trichoconiella*, and *Pseudomonas*, etc... Its common symptom can be observed as darkening glumes or spikelets, brown to black color in rotten glumes by one or more pathogens affected, intensity ranges from sporadic discoloration to discoloration of whole glumes. The discoloration may appear externally on the glumes or internally on the kernels, or both (Ou 1985). On the glumes, symptoms accordingly vary. It depends on which organism involved and the degree of infection. The disease has trended to increase year by year in the delta with higher damageable level. The disease does not only decrease seed quality but also affect to rice grain property quality. It is needed to investigate the grain discoloration to rice quality and seed quality.

Objectives:

- To study the influence of disease scale to seed quality and rice quality.
- To understand differences among rice genotypes based on disease index

MATERIALS AND METHODS**1. Materials**

a. 2003 winter-spring: OM1490, ST3, IR64, OMCS2000, Jasmine 85

Germination rates (%), head rice (%) were noticed.

b. 2004 summer-autumn: OM2008 (glutinous), Jasmine 85, DS-20, OM1490, OM4086, OMCS2000, OM4872, OM3419

c. 2004 winter-spring: OM4086, OM3238, OM2008, OM2395, OM4872, OM4495, OM3536, OM2492, OM4498, OM2718

2. Methods

Experiments were laid out in RBD with three replications. Target traits as 1000-grains weight, germination rate (%), disease index (%), disease rate (%), rice yield were scored (IRRI 1998). Data were analyzed by IRRISTAT

Diseased scale followed IRRI's standard 1998 as:

Level 0: no incidence.

Level 1: less than 1%.

Level 3: 1-5%.

Level 5: 6-25%.

Level 7: 26-50%.

Level 9: 51-100%.

Diseased index = $(\sum (axb) / (N \times T)) \times 100$.

$\sum (axb)$: sum total of product of number of diseased seed on each level with the following value of diseased scale (Vu Trieu Man, 1998).

N: sum total of collected seeds.

T: the highest diseased scale value of the rank board.

RESULTS AND DISCUSSION**1. Experiment in 2004 dry season****1-1. Influence of discoloration disease to seed germination**

Seed germination of rice varieties significantly decreased if diseased scale increased (table 1a). Germination rate in ST3 genotype varied from 88% to 61% if disease scale exhibited from 0 to 9, respectively. Similarly, Jasmine 85 varied from 87% to 61%. These varieties were affected by discoloration disease in 2003 dry season. Germination rate was noticed to be the highest in OM1490 (98%) and OMCS2000 (96%) under condition of disease free. No significant difference of seed germination was observed in case of disease score of 1 as compared to 0. Otherwise, there is significant difference of seed germination in case of score 9 as compared to 0. Nguyen Duc Cuong et al. (2000) similarly recognized the same result.

Table1a: Influence of discoloration disease to seed germination in 2004 dry season

| Disease score | OM1490 | ST3 | IR64 | OMCS2000 | JASMINE 85 |
|---------------|--------|-----|------|----------|------------|
| 0 | 98a | 88a | 95a | 96a | 87a |
| 1 | 96a | 87a | 95a | 93a | 84ab |
| 3 | 87b | 85a | 90b | 86b | 80b |
| 5 | 85b | 74b | 86bc | 81c | 73c |
| 7 | 79c | 70b | 83c | 76d | 72c |
| 9 | 76c | 61c | 67d | 72d | 61d |
| F | ** | ** | ** | ** | ** |
| CV (%) | 2.3 | 3.5 | 2.79 | 3.16 | 4.31 |

Figures followed by the same letter are not significant at the level of 0.05

1-2. Influence of discoloration disease to head rice percentage

Head percentage of rice varieties significantly decreased if diseased scale increased (table 1b). Head rice percentage offered the highest value when incidence disease was observed at score 0, and the lowest as score 9. Tran Minh

Tam (1997) indicated that fungi or bacteria developed on seed to disintegrate their cells on the surface of seed, then entered inside to damage albumen, to change the color of albumen, to made seed lost resilient when husked seed became easy broken.

Table 1b: Influence of discoloration disease to head percentage in 2004 dry season

| Disease score | OM1490 | ST3 | IR64 | OMCS2000 | JASMINE 85 |
|---------------|--------|--------|--------|----------|------------|
| 0 | 45.45a | 25.71a | 41.94a | 37.51a | 26.66a |
| 1 | 45.11a | 23.78b | 40.40a | 33.49c | 25.89b |
| 3 | 44.48a | 19.23c | 35.22a | 33.44c | 25.28b |
| 5 | 44.00a | 17.96d | 33.55a | 35.45b | 24.59c |
| 7 | 37.34b | 17.78d | 31.12b | 31.51d | 22.55d |
| 9 | 20.85c | 14.77e | 29.00c | 15.81e | 15.95e |
| F | ** | ** | ** | ** | ** |
| CV(%) | 2.13 | 1.88 | 2.90 | 2.33 | 1.58 |

Figures followed by the same letter are not significant at the level of 0.05

2. Experiment in 2004 wet season

2-1. Influence of discoloration disease to 1000-grain weight

Grain weight of rice varieties significantly decreased at the level of 0.05 if diseased scale

increased (table 2a). 1000-grain weight of Jasmine 85 obtained the highest (27.7g) then OMCS2000 (27.4g); the lowest 1000-grain weight was noticed in DS20 (19.3g).

Table 2a: Influence of discoloration disease to 1000-grain weight in 2004 wet season

| Disease score | OM2008 (glutinous) | Jasmine 85 | DS20 | OM1490 | OM4086 | OMCS 2000 | OM48 72 | OM34 19 |
|---------------|--------------------|------------|-------|--------|--------|-----------|---------|---------|
| 0 | 25.3a | 27.7a | 22.0a | 24.5a | 24.9a | 27.4a | 24.6a | 25.9a |
| 1 | 25.0b | 27.6a | 21.8b | 24.0b | 24.5b | 27.3a | 24.2b | 25.7a |
| 3 | 24.5c | 27.2b | 21.8b | 23.7c | 24.1c | 27.1b | 24.2b | 25.4b |
| 5 | 23.9d | 27.2b | 21.6c | 23.6c | 24.1c | 26.7c | 24.2b | 25.3b |
| 7 | 23.6e | 26.0c | 21.3d | 23.3d | 23.3d | 26.4d | 23.8c | 25.2b |
| 9 | 22.5f | 23.1d | 19.3e | 22.6e | 22.5e | 25.4e | 22.6d | 24.5c |
| CV (%) | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.2 | 0.3 | 0.4 |

Figures followed by the same letter are not significant at the level of 0.05

2-2. Influence of discoloration disease to seed germination in 2004 wet season

Seed germination of rice varieties significantly decreased if diseased scale increased (table 2b). No significant difference of seed germination at the level of 0.05 was observed in case of disease score of 1 as compared to 0. The highest seed germination

percentage was noticed in OM1490 (97%) under free seed disease and the lowest in OM3419 (87%). Under seed discoloration at score 9, the highest seed germination was observed in OM4086 (76.7%). OM2008 and Jasmine 85 exhibited the lowest germination rate.

Table 2b: Influence of discoloration disease to seed germination in 2004 wet season

| Disease score | OM2008 | Jasmine 85 | DS-20 | OM1490 | OM4086 | OMCS2000 | OM4872 | OM3419 |
|---------------|--------|------------|-------|--------|--------|----------|--------|--------|
| 0 | 87.8a | 88.3a | 95.7a | 97.0a | 95.0a | 92.0a | 90.7a | 87.0a |
| 1 | 83.7ab | 85.7a | 92.3a | 94.7a | 95.0a | 91.3a | 89.7ab | 85.3a |
| 3 | 76.7b | 78.7b | 86.7b | 89.7b | 92.7ab | 88.0a | 83.0bc | 80.3a |
| 5 | 73.7bc | 67.3c | 82.0c | 86.3bc | 90.0b | 83.0b | 79.3c | 81.0a |
| 7 | 65.0cd | 70.7c | 79.3c | 85.3c | 83.3c | 77.0c | 78.0c | 81.3a |
| 9 | 55.7d | 58.0d | 68.7d | 73.7d | 76.3d | 66.7d | 69.7d | 70.7b |
| CV(%) | 7.8 | 4.5 | 2.6 | 2.6 | 2.8 | 3.1 | 4.7 | 5.3 |

Figures followed by the same letter are not significant at the level of 0.05

2-3. Discoloration disease index among difference rice genotypes in 2004 wet season

We indicated that almost of rice varieties to hold good after harvest time. Diseased index was lowest with OM4086, OM3419. Rice varieties had highest diseased index such as OMCS2000, OM1490. This data indicated in

Table 2c and figure. We observed that OMCS2000 had highest diseased index (31.67%) and difference about statistic with 5% meaning to compare with the remain varieties. OM4086 had lowest diseased index (15.3%). The other varieties had average diseased index.

Table 2c: Discoloration disease index among rice genotypes in 2004 wet season

| No. | Designation | Discoloration disease score | | | | | | Disease index (%) |
|-----|-------------|-----------------------------|------|------|------|------|-----|-------------------|
| | | 0 | 1 | 3 | 5 | 7 | 9 | |
| 1 | OM2008 | 35.0 | 33.3 | 13.3 | 8.7 | 5.7 | 4 | 21.37 bc |
| 2 | Jasmine 85 | 27.3 | 35.3 | 20.3 | 10.7 | 3.7 | 2.7 | 22.15 bc |
| 3 | DS-20 | 27.7 | 33.0 | 19.3 | 12.0 | 5.0 | 3 | 23.67 b |
| 4 | OM1490 | 30.3 | 30.0 | 16.0 | 10.7 | 8.3 | 4.7 | 25.74 b |
| 5 | OM4086 | 59.0 | 19.7 | 7.0 | 6.3 | 3.3 | 4.7 | 15.30 d |
| 6 | OMCS2000 | 21.0 | 30.0 | 15.0 | 18.3 | 11.3 | 4.4 | 31.67 a |
| 7 | OM4872 | 40.0 | 19.3 | 22.3 | 9.0 | 4.0 | 5.4 | 23.04 bc |
| 8 | OM3419 | 53.7 | 15.3 | 14.7 | 9.0 | 5.0 | 2.3 | 17.81 cd |
| | CV % | | | | | | | 13.5 |

Figures followed by the same letter are not significant at the level of 0.05

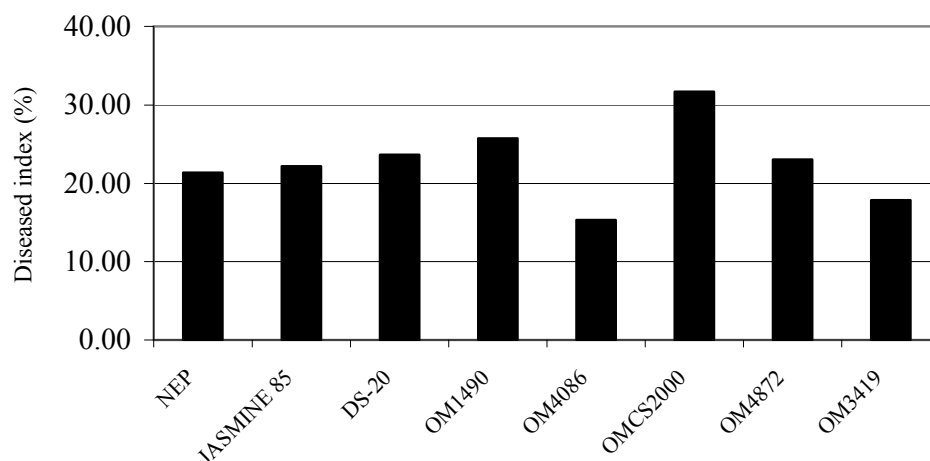


Figure1: Disease index among tested rice varieties in 2004 wet season

3. Experiment in 2005 dry season

Seeds from 2004 wet season were maintained to conduct yield trial in 2005 dry season. Grain yield and disease index were recognized in table 3. OM3238 and OM4872 obtained the highest yield (7.34 t/ha). OM3536 gained the lowest (5.27 t/ha).

Disease index exhibited very high in OM2718 and OM2395, but the lowest in OM4872. The

difference was statistically significant at the level of 0.05

Diseased rate exhibited in all genotypes. However, each variety was different about diseased rate. The highest rate was noticed in OM2008 and OM2395. Two genotypes were strongly infected by discoloration disease. OM4872 was identified as tolerant variety under field testing condition.

Table 3: Rice yield and discoloration disease exhibited in 2005 dry season.

| Designation | Grain yield (t/ha) | Disease index (%) | Disease rate (%) |
|-------------|--------------------|-------------------|------------------|
| OM3238 | 7.34a | 11.78b | 45.33b |
| OM4872 | 7.34a | 9.63b | 34.00b |
| OM2718 | 6.93ab | 11.41b | 40.00b |
| OM4498 | 6.80ab | 16.67b | 58.00ab |
| OM4086 | 6.79ab | 16.78b | 49.00b |
| OM2492 | 6.79ab | 15.04b | 60.00ab |
| OM2008 | 6.62ab | 26.48a | 76.33a |
| OM2395 | 6.54ab | 24.81a | 78.00a |
| OM4495 | 5.75ab | 13.22b | 55.67ab |
| OM3536 | 5.27b | 12.93b | 54.00ab |
| CV% | 12.0 | 26.45 | 25.13 |

Figures followed by the same letter are not significant at the level of 0.05

CONCLUSION

1. Conclusion:

- Seed germination of Jasmine 85 was significantly affected by discoloration disease in both wet and dry seasons. However, seed germination of OM1490 was not
- Number of filled grains / panicle, 1000-grain weight decreased, head rice percentage due to discoloration disease.
- OM2008 and OM2395 were susceptible varieties to the disease and OM3238, OM4872 and OM2718 were less sensitive to one.

REFERENCES

- Ghosh AJ, S Govindaswamy 1972. Inheritance of starch iodine blue value and alkali digestion value in rice and their genetic association. RISO 21: 123-132.
- Nguyen Duc Cuong, Huynh Van Nghiep and Pham Van Du.2000. Researching about discoloration disease on rice at Cuu Long Delta and the method to control. OMONRICE 11: 103-109..
- Ram T, J Singh, RM Singh 1989. Dominant relationship and nature of genetic variances for yield and its components in rice. Int. Rice Res. Newsl. 14(4):6
- Ou SH. 1985. Rice disease. 2nd Edition. Commonwealth Mycology Institute, Surrey, England. 380pp.
- Sadivam S and A Manikam 1992. Biochemical methods for agricultural sciences. Wiley Eastern Ltd. India. Wiley Eastern Ltd.India.
- Singh RK, BD Chaudhary 1985. Biometrical methods in quantitative genetic analysis. Kalyani Publisher, New Delhi, India.
- IRRI. 1998. Standard evaluation system for rice. IRRI. Los Banos, Laguna, Philippines
- Tran Minh Tam.1997.Conservation and processing agricultural post-harvest product. Agricultural Publishing House. Ho Chi Minh City-1997.
- Vu Trieu Man.1998. Plant pathogens textbook. Educational Publishing House. vtman@hn.vnn.vn

Ảnh hưởng của bệnh trên hạt đến chất lượng hạt giống

Trong những năm gần đây, bệnh khá phổ biến trên lúa ở ĐBSCL là bệnh lem lép hạt. Bệnh có xu hướng tăng về diện tích lẫn mức độ thiệt hại. Thí nghiệm được lập lại qua 3 vụ liên tiếp: ĐX 2003-2004, HT 2004 và ĐX 2004-2005. Cấp bệnh dựa theo tiêu chuẩn của IRRI 1996. Chỉ số bệnh theo Vũ Trệu Mân,1998.

Tỉ lệ nảy mầm của Jasmine 85 bị ảnh hưởng bởi bệnh lem lép hạt trong cả hai vụ Đông Xuân và Hè Thu, nhưng OM1490 không bị ảnh hưởng. OM2008 và OM2395 là hai giống nhiễm bệnh khá nặng trong vụ Đông Xuân 2004-2005. OM3238, OM4872, OM2718 xem như không có triệu chứng bệnh trong Đông Xuân 2004-2005.

Trọng lượng 1000 hạt, số hạt chắc trên bông, tỉ lệ gạo nguyên giảm do bệnh lem lép hạt. Trong đó, OMCS2000 bị ảnh hưởng bởi bệnh này nặng nhất.