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APPLICATION OF SEED CLEANING IN MANAGEMENT OF SEED-BORNE DISEASES OF RICE

Pham Van Du, Huynh Van Nghiep and Nguyen Duc Cuong

ABSTRACT

On farm research using manual seed cleaning and seed treating by a 15% brine solution are the simple and easy practice that did not harm to the environment. Experiments were conducted in the two continuous seasons, 2001 wet season and dry 2002 dry season. Ten farmers were selected to participate the experiment. Results showed that farmer's fields used clean seeds decreased transmission of rice seed-borne diseases such as brown spot, red stripe, leaf scald, bacterial leaf blight, sheath rot and grain discoloration. Yield increased from 12 to 15 % and quality of seeds were observed in which 7.4-10.65% clean seeds in the dry season and 9.27-9.6% in the wet season. Moreover, use of clean seeds also decreased 5.83-8.73% unfilled grains in the dry season and 8.32-8.65% discolored seeds in the wet season.

Key words: Alternaria padwickii, Bipolaris oryzae, Fusarium moniliforme, Fusarium pallidoroseum, Microdochium oryzae, Sarocladium oryzae, seed-borne diseases, seed cleaning

INTRODUCTION

High quality of seed undertakes the most important role in rice production, with the emphasis on seed health aspect.

At present, about 76.5% of farmers in the Mekong Delta produced their own seeds for the next crop, about 36.5% of farmers removed all of type-off plants before harvest and only 6% of farmers preserved seed in a separate container (Vo et al. 2001). Almost of seed samples collected in the Mekong Delta were infected by several seed-borne pathogens such as *Bipolaris oryzae, Alternaria padwickii, Fusarium moniliforme, Fusarium pallidoroseum, Microdochium oryzae, Sarocladium oryzae*, *Acidovorax avenae sp. avenae* and *Burkholderia glumae*. These pathogens caused lower germination of seed and transmitted diseases from seed to rice plants (Huynh et al. 2001). Farmers usually dried and winnowed seeds but did not care of seed treatment before sowing (Vo et al. 2001). In Bangladesh, a simple technique of manual seed cleaning was adopted effectively in improving seed quality (Mathur et al. 2001).

The study aims at introducing manual seed cleaning and seed treating with a 15% brine solution as a feasible recommendation to farmers.

MATERIALS AND METHODS

Ten farmers at Omon district, Cantho province were selected to participate this study. Each farmer's field consisted of three treatments and the plot area was 300 m^2. Treatments were:

1- Manual seed cleaning
2- Seed cleaning by a 15% brine solution.
3- Untreated seeds (check)

Sowing time was from 25-30 June 2001 in wet season (WS) and 5-15 December 2001 in dry season (DS).

Harvesting time was from 20-30 September in 2001 WS and 5-20 March in 2002 DS.

IR50404, one of leading varieties in the delta was used. Cultural practices were applied as local extension's recommendations. The fertilizer formula was 80-40-30 and 100-40-30 kg NPK / ha in WS and DS, respectively. Pest management was used based on injury threshold level of rice pests. However, discoloration and brown spot diseases were not control by fungicides. Seed rate was 200 kg/ha. Observations on planting density, infection levels of seed-borne diseases were

done at 15, 30, 50, 75 days after sowing (DAS) and at harvest time. Yield and yield components were collected at harvesting time.

RESULTS & DISCUSSIONS

Effect of clean seeds on infection of seed-borne diseases of rice

Six common seed-borne diseases were detected on rice as brown spot, red stripe, leaf scald, bacterial leaf blight, sheath rot and discoloration diseases. Brown spot is caused by fungus *Bipolaris oryzae*, the disease early occurred at 15 DAS and became common during all stages of rice. Seeds which were cleaned by manual or treated by 15% brine solution, had the lower infection of the disease as compared to untreated seeds (Figure 1)

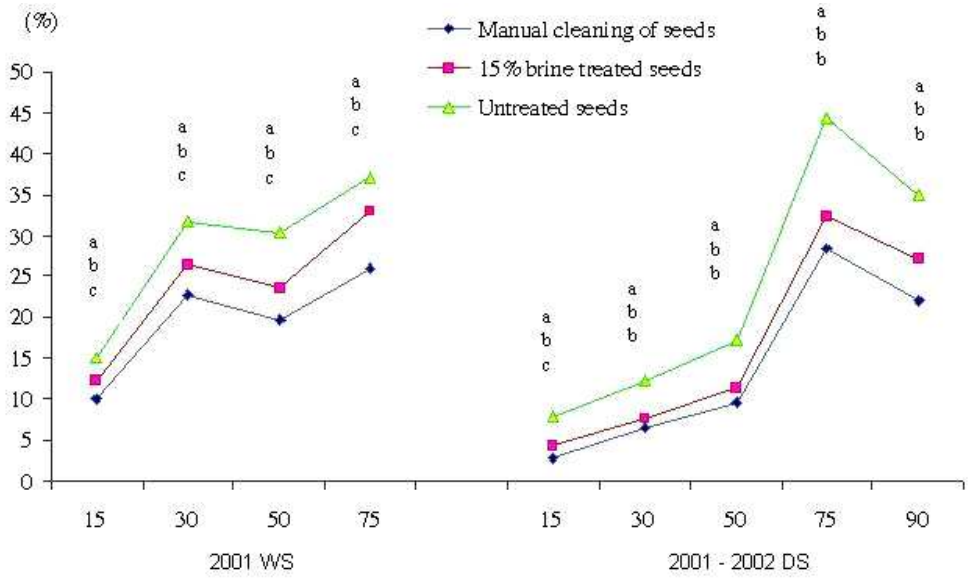


Figure 1: Effect of clean seeds on infection of brown spot disease

Red stripe disease (Kaku et al. 2000; Mew et al. 2001) may be caused by bacterium *Microbacterium sp.*. However, the disease can be managed with low severity by balancing fertilizer application, especially with lower N fertilizer and seeding rate. The disease occurred at late stage of rice growth from 50 to 75 DAS and infection level of the disease was found not to be significantly different among treatments (Figure 2)

Leaf scald disease is caused by fungus *Microdochium oryzae*. The disease appeared late, at 50 DAS. Infections of the disease among treatments were lower but highly significant differences in the untreated seeds as compared to treated seeds (Figure 3).

Bacterial leaf blight is caused by bacterium *Xanthomonas oryzae pv. oryzae*, the disease occurred late at 50 DAS, the use of clean seeds decreased infection of the disease under field condition although infection level of the disease was commonly low during all stages of rice crop (Figure 4).

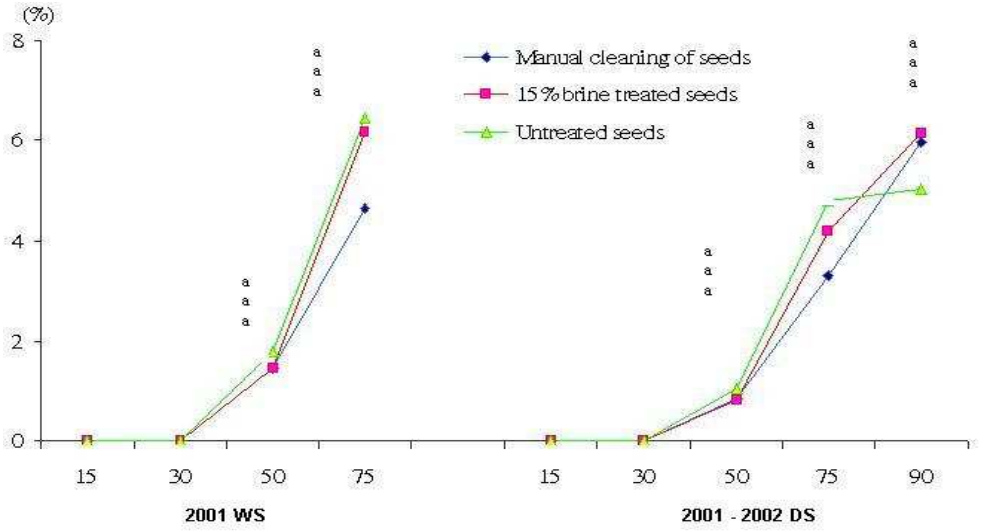


Figure 2: Effect of clean seeds on infection of red stripe disease

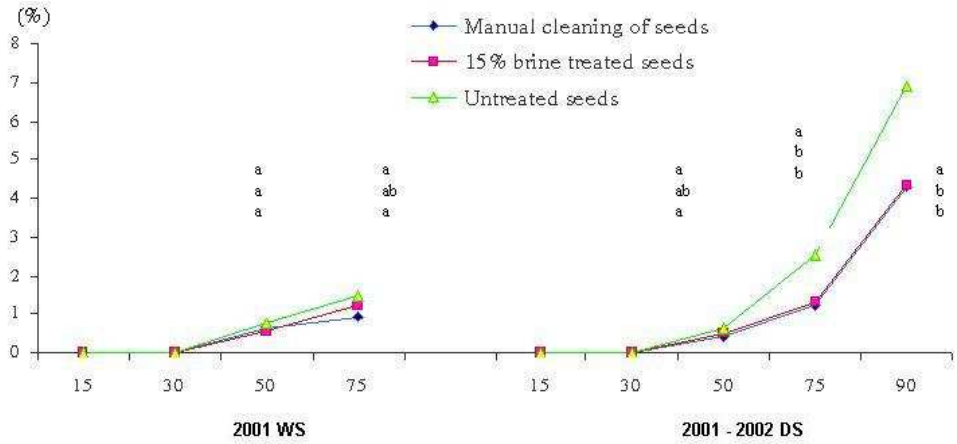


Figure 3: Effect of clean seeds on infection of leaf scald disease

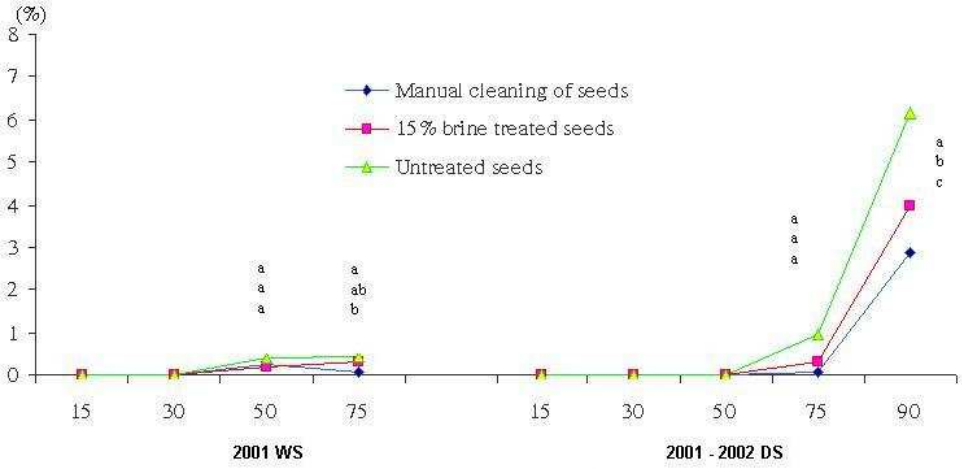


Figure 4: Effect of clean seeds on infection of bacterial leaf blight disease

Sheath rot disease is caused by fungus *Sarocladium oryzae*, the disease appeared relatively late at 50 DAS and infection of the disease was low ranged from 0% to 4.87%, clean seeds were found to be infected by the disease less than untreated seeds in dry season only (Figure 5)

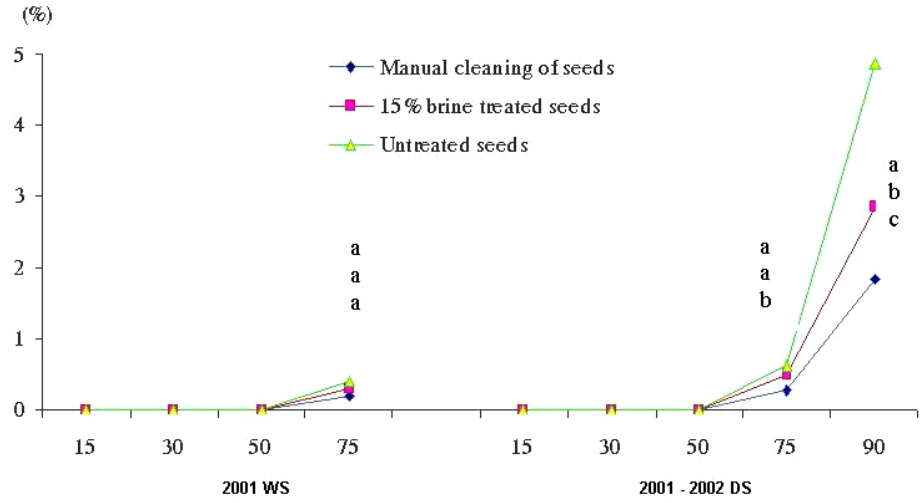


Figure 5: Effect of clean seeds on infection of sheath rot disease

Effect of clean seeds on tillering ability: Number of tillers and panicles per m^2 were not significantly different among treatments. But manual cleaning of seed offered the highest ability of tillering in the dry season as compared to untreated seeds (Figure 6).

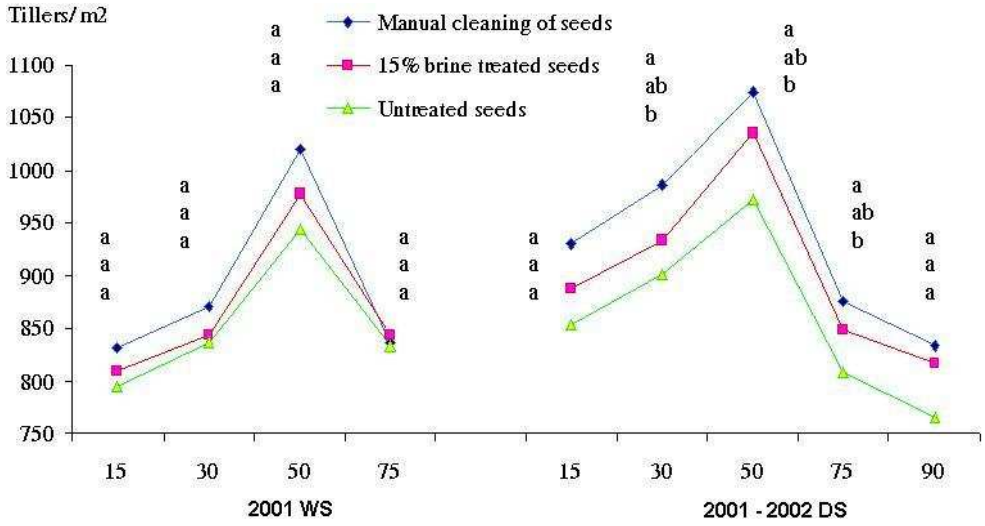


Figure 6: Effect of clean seeds on tillering ability and panicles

Effect of clean seeds on yield and yield components

1000-grain weight was significantly different among treatments in both rice seasons (Figure 8).

Yield: manual cleaning of seeds significantly obtained high yield as compared to untreated seeds. Use of clean seeds over yielded from 12 to 15 % in both wet and dry seasons (Figure 9)

Effect of clean seeds on seed quality

Level of seed clean: The treated seeds increased 7.4-10.65% clean seeds in the dry season and 9.27-9.6% in the wet season. Moreover, use of clean seeds decreased 5.83-8.73% unfilled grains in the dry season and 8.32-8.65% discolored seeds in the wet season (Figure 7).

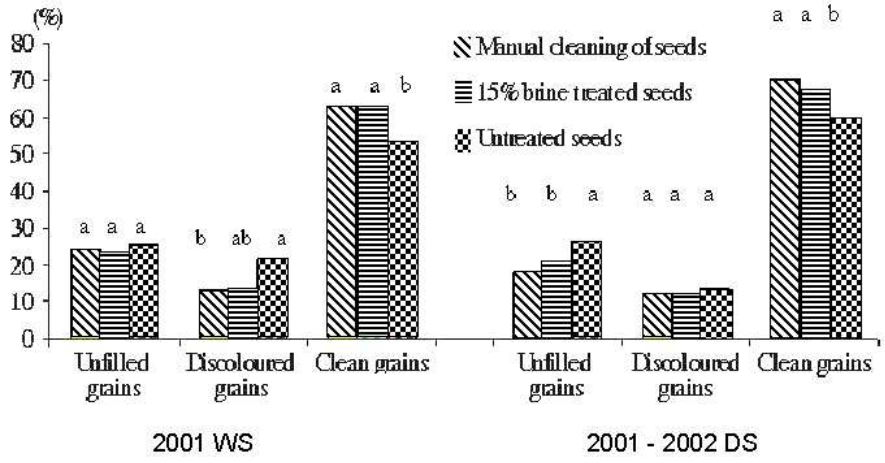
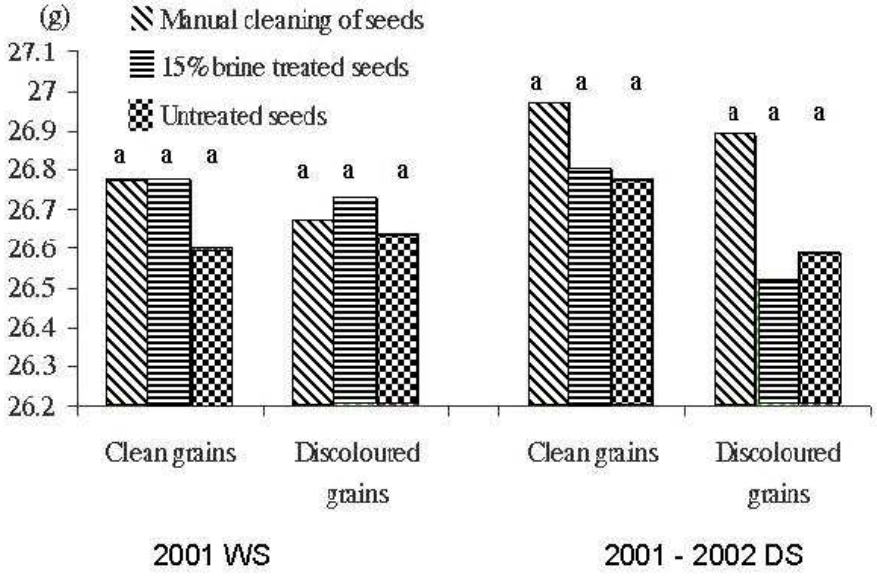


Figure 7: Effect of clean seeds on quality of seeds



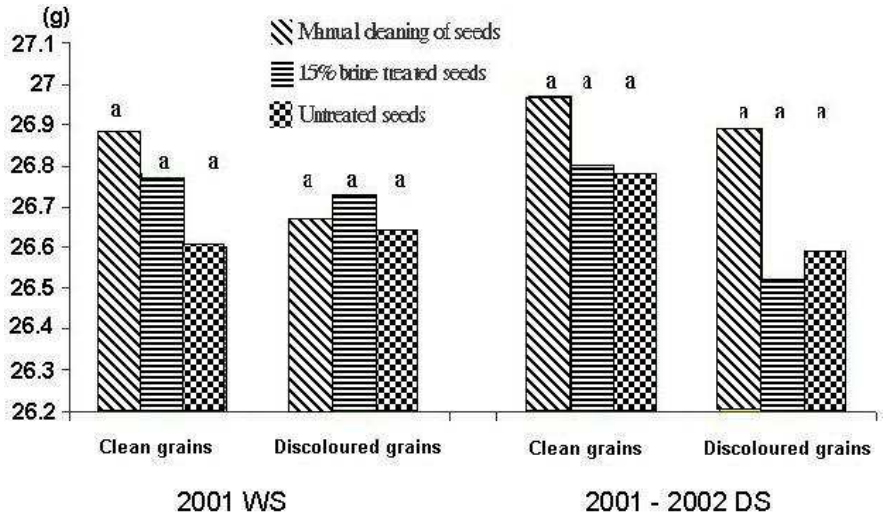


Figure 8: Effect of clean seeds on 1000-grain weight

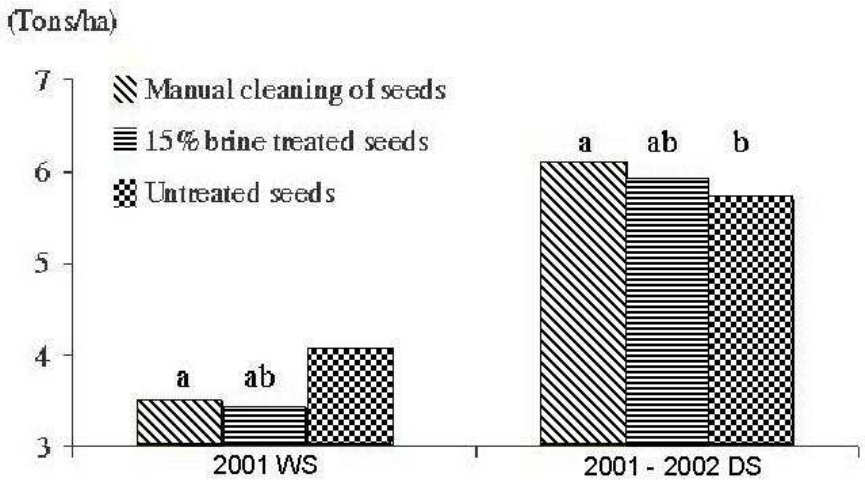


Figure 9: Effect of clean seeds on rice yield

CONCLUSION

Manual cleaning of seed and seed treating by 15% brine solution improved status of seed-borne disease infection and disease transmission from seeds to rice plants such as brown spot, leaf scald, bacteria leaf blight, sheath rot. Moreover, they also increased clean seeds and rice yield.

SUGGESTION

Studies on seed health such as detection of seed-borne pathogens, seed infected by bacteria seed treatment and field management of seed-borne diseases need to be conducted in upgrading seed and grain quality and yield.

REFERENCES

Huynh Van Nghiep, Pham van Du, SB Mathur. 2001. Effect of cleaning on seed health and seed germination of rice. OMonRice 9: 138-139

Kaku H, S Siti, O Hirokaku, 2000. Red stripe of rice is caused by a bacterium *Microbacterium* sp. J. Gen. Plant Pathol. 66: 149-152.

Mathur SB, MH Talukder, MS Veena and CN Mortensen. 2001. Improvement in seed health and seed germination by manual cleaning of rice seeds. Proceeding of International workshop on seed health testing. Council of Agriculture. R.O.C. 45-56 pp.

Mew TW, NP Castilla, FA Elazegui, CM Vera Cruz. 2001. The etiology of red stripe of rice: current status and future directions. IRRN 26.1 (4).

Nguyễn Đức Cương, Huỳnh Văn Nghiệp. Phạm Văn Dư. 2001. Nghiên cứu bệnh lem lép hạt trên lúa ở Đồng Bằng Sông Cửu Long và biện pháp phòng trừ. Kết quả nghiên cứu khoa học 2000-2001- Viện Lúa ĐBSCL. 99-108.

Pham Van Du, Le Cam Loan, Nguyen Duc Cuong, Huynh Van Nghiep and Nguyen Duc Thach. 2001. Survey on seed borne fungi and its effects on grain quality of common rice cultivars in the Mekong Delta. OmonRice 9: 107-113

Vo Van A, Ho Van Chien, Le Quoc Cuong and Le Van Han. 2001. Farmers' perception on rice seed management of some provinces in Southern Vietnam.. Proceeding of Workshop on rice seed health for disease management. Plant protection department – IRRI. 1-14.

SUMMARY IN VIETNAMESE

Quản lý bệnh truyền qua hạt lúa bằng kỹ thuật làm sạch mẫu hạt

Sử dụng phương pháp lựa hạt giống sạch và dùng dung dịch muối pha loãng 15% trước khi gieo sạ trên ruộng nông dân những kỹ thuật đơn giản và dễ thực hiện.Phương pháp xử lý này không tác hại đối với môi trường. Thí nghiệm với sự tham gia của nông dân được thực hiện qua 2 vụ Hè thu 2001 và Đông xuân 2001-2002. Mười hộ nông dân đã được chọn để tham gia thí nghiệm. Kết quả cho thấy rằng: ruộng nông dân sử dụng hạt giống sạch trước khi gieo sạ bằng 2 phương pháp trên, giảm đi được một số bệnh truyền qua hạt như đốm nâu, vàng lá, khô đầu lá, bạc lá, thối bẹ và lem lép hạt. Năng suất gia tăng từ 12 đến 15 %, ngoài ra phẩm chất của hạt thu hoạch, hạt sạch tăng 7.4-10.65% ở vụ đông xuân và 9.27-9.6% trong vụ hè thu. Kết quả cho thấy sử dụng hạt sạch để gieo sạ sẽ giảm 5.83-8.73% hạt lem lép vụ đông xuân và 8.32-8.65% hạt lem lép trong vụ hè thu.