*J. Trop. Agric. and Fd. Sc. 44(2)(2016): 167 – 178*

# Effect of organic fertiliser as a basal fertiliser on growth, yield and disease incidence of local fragrant rice varieties

H. Shahida[1], M. Siti Norsuha[1], A.B. Nur Khairani[2], M.Y. Mohamad Najib[1], M.R. Muhammad Naim Fadzli[1], R. Asfaliza[1] and M. Y. Shajarutulwardah[1]

[1]Rice and Paddy Research Centre, MARDI Seberang Perai,13200 Kepala Batas, Pulau Pinang, Malaysia
[2]Promotion and Business Development Centre, MARDI Kota Bharu, 15710 Kota Bharu, Kelantan, Malaysia

**Abstract**
The effect of organic fertiliser as a basal fertiliser on the performance and disease incidence of local fragrant rice varieties, MRQ 74 and MRQ 76 was studied during main-season 2012/2013 and off-season 2013. Organic fertiliser at the rates of 500, 1,000, 1,500, 2,000, 2,500 and 3,000 kg/ha which equivalent to 25, 50, 75, 100, 125 and 150 kg N/ha respectively, were incorporated into the soil a week before seedlings were manually transplanted. No organic fertiliser was used in the control. Results indicated that organic fertiliser contributes to number of tillers and SPAD value. SPAD value increased by 20% when organic fertiliser at the rate of 1,500 kg/ha and more was applied to the plant. Higher number of tillers was observed when organic fertiliser at the rate of 2,000 kg/ha was given as a basal fertiliser. Yield was affected by season and organic fertiliser. The yield of MRQ 74 was 57.34% higher than MRQ 76 during MS 2012/2013. The yield recorded during OS 2013 was higher than MS 2012/2013 for all organic fertiliser rates tested including control. Application of organic fertiliser up to 3,000 kg/ha encourages the incidence of sheath blight disease which increased by 39.7% than the control.

Keywords: MRQ 74, MRQ 76, organic fertiliser, rice diseases, yield

## Introduction

Fragrant rice is classified as specialty rice due to its special characteristics such as taste and aroma. It becomes popular among Malaysian because BERNAS (2008) estimated that about 20% of the total imported rice was fragrant and basmathi types. The highest import value for this high quality rice in 2006 was 167,312 metric tonnes while demand for specialty rice shows an increasing trend in 2004 – 2007 periods with an average growth rate of 3.48%. In a global rice trade, fragrant rice has gained significant market shares during the last 15 years. In Malaysia, efforts have been taken to develop fragrant rice varieties through breeding program in MARDI since the last 10 years. Currently, two fragrant rice varieties have been released namely MRQ 74 and MRQ 76. MRQ 74 was released in February 2005 and it derived from crosses between Q34 and Khao Dawk Mali 135 (KDML 135) and similarly like Basmathi type. MRQ 76 was officially released in September 2012 and it derived from crosses between Q 72 and Chuichak and its trait is similarly like Jasmine type. KDML and Chui Chak are non-glutinous aromatic rice.

Several papers have reported on the effects of organic fertilisers on the performance of MRQ 74. Mohamad Najib et al. (2013) reported that a few commercial organic fertilisers tested on MRQ 74 showed significant effects on number of tiller, number of panicle per meter square and grain yield. However, no reports have been

*Article history*
Received: 10.4.15
Accepted: 22.6.15

Authors' full names: Shahida Hashim, Siti Norsuha Misman, Nur Khairani Abu Bakar, Mohamad Najib Mohd Yusof, Muhammad Naim Fadzli Mohd Rani, Asfaliza Ramli and Shajarutulwardah Mohd Yusob
E-mail: shahida@mardi.gov.my

documented on effects of organic fertiliser on MRQ 76. Organic fertilisers need to be supplemented with a basal dressing of chemical fertiliser because organic farming alone does not supply enough nutrients in tropical Asian countries (Morteza et al. 2011). Furthermore, application of organic materials has been found to bring about a gradual improvement in soil productivity and crop performance over a longer period of time (Morteza et al. 2011). The other issue related to organic fertiliser is the interaction between organic soil and pest and diseases. Chau and Heong (2005) stated that high organic matter soil and active soil biological activity generally exhibit not only good soil fertility but complex food webs and beneficial organisms that prevent infection. Ramesh et al. (2005) concluded that organic crops were more tolerant as well as resistant to insect attacks and have thicker cell wall and lower levels of free amino acid than conventional rice.

Hence, this study was conducted to determine effects of organic fertiliser applied as basal fertiliser to crop performance as well as resistance of MRQ 74 and MRQ 76 to major rice diseases.

**Materials and methods**

The study was conducted at MARDI Seberang Perai during main-season 2012/2013 (MS 2012/2013) and off-season 2013 (OS 2013). Local fragrant rice varieties namely, MRQ 74 and MRQ 76 were used in this study. The treatments were arranged in randomised complete block design with four replications. Rates of commercial organic fertiliser used were 500, 1,000, 1,500, 2,000, 2,500 and 3,000 kg/ha which equivalent to 25, 50, 75, 100, 125 and 150 kg N/ha respectively and they were incorporated into the soil as basal fertiliser a week before seedlings were transplanted. No organic fertiliser was used for the control treatment. Source of nitrogen was splitted four times during 5, 20, 40 and 60 days after transplanting (DAT) with percentage of 15, 35, 40 and 10, respectively. The organic fertiliser was analysed for determination of chemical properties (*Table 1*). The plot size used was 4 m x 4 m. The 18 day seedlings were manually transplanted to the field with planting distance of 25 cm x 25 cm. Pest and disease were monitored according to the standard practices suggested in *Manual Teknologi Penanaman Padi Lestari* (Azmi et al. 2008). Data on growth performance such as number of tiller and leaf greenness were recorded during 45 DAT by selecting 4 culms from each plot. Leaf greenness was recorded using chlorophyll meter (SPAD 502, Minolta, Japan).

At maturity stage, plants were cut from one square meter area from the centre of each plot for measuring grain yield and converted to per hectare basis. The hills that were previously selected for counting number of tillers and leaf greenness were then cut from ground level from each plot for recording the number of panicle, number of spikelets per panicle, percentage of filled grain and 1,000-grain weight.

Table 1. Main chemical properties of the organic fertiliser used

| Chemical properties | Value |
|---|---|
| pH | 7.69 |
| Total N (%) | 5.70 |
| Total C (%) | 5.37 |
| P (%) | 2.87 |
| K (%) | 4.91 |
| Mg (%) | 1.06 |
| CEC (meq/100 g) | 15.98 |
| C:N ratio | 1:1 |

***Statistical Analysis***

SAS Version 9.3 (SAS Institute 2011, Gary, NC) was used to analysed the data using analysis of variance (ANOVA). Treatment differences were separated using Duncan multiple range test (DMRT). Correlation analysis by means of Pearson's correlation matrix was performed to establish the associations among all parameters tested.

## Results and discussion

### *Plant growth*

*Table 2* showed that there were no interaction effect between variety x organic fertiliser for both number of tiller and SPAD value. Number of tillers and SPAD value were affected by different rates of organic fertiliser but variety did not contribute to number of tillers produced.

Leaf greenness showed chlorophyll level in the plants and it can be measured using chlorophyll meter. Chlorophyll meter provides instantaneous on-site information on crop nitrogen status as SPAD reading in a non-destructive manner. SPAD value was affected when organic fertiliser was applied at higher rate. Application of organic fertiliser as low as 1,500 kg/ha increased the SPAD value by 20% compared to the control (*Table 2*). This indicated that the nitrogen status of the plant is acceptable because Peng et al. (1996) suggested that the optimum SPAD value for the optimum grain yield was 35 for indica varieties grown under tropical condition. Balasubramaniam et al. (2000) and Huang et al. (2008) also reported that rice varieties with different characteristics have different optimum or threshold value. High percentage of total nitrogen in the organic fertiliser used (*Table 1)* may contribute to the increment of SPAD value in treated plants. Previous studies have shown a relationship between nitrogen and chlorophyll contents in plant leaves (Peng et al.1993; Balasubramaniam et al.1999). Sufficient nutrient facilitated to the plant resulting a maximum cell elongation or cell division of the leaves (Mirza et al. 2010).

Production of tillers in fragrant rice varieties were also influenced by different rates of organic fertiliser (*Table 2*). Plants treated with organic fertiliser at the rate of 2,000 kg/ha showed better number of tillers as compared to other treatment. Tillering is an important trait for grain production and it is also an important aspect of rice growth improvement. Control treatment showed the lowest number of tillers and this may be due to insufficient or loss of nitrogen through volatilisation, leaching and run-off.

Table 2. Number of tillers and SPAD value of fragrant rice as affected by varieties and organic fertilisers

| Factor | Number of tiller | SPAD value |
|---|---|---|
| Variety (V) | | |
| MRQ 74 | 38.14a[z] | 32a |
| MRQ 76 | 37.76a | 25b |
| Organic fertiliser (O) | | |
| 0 kg/ha | 37.13b | 25c |
| 500 kg/ha | 38.01b | 26bc |
| 1,000 kg/ha | 37.24b | 25c |
| 1,500 kg/ha | 37.85b | 30ab |
| 2,000 kg/ha | 38.10ab | 32a |
| 2,500 kg/ha | 38.08ab | 30ab |
| 3,000 kg/ha | 39.25a | 31ab |
| V | 2.01ns | 795.08** |
| O | 3.91* | 68.24* |
| V x O | 2.42 ns | 38.18ns |

[z]Mean separation within columns and treatments by Duncan multiple’s range test
ns *, ** Non-significant, significant at ($p \leq 0.05$) and ($p \leq 0.01$), respectively

### *Yield and yield components*

Analysis shows that there was significant interaction between season x variety on yield and number of panicle. The yield of MRQ 74 was 57.34% higher than MRQ 76 during MS 2012/2013, while in OS 2013, the yield recorded by MRQ 76 was only 4.23% higher than MRQ 74 (*Figure 1a*). Panicle number of MRQ 74 was higher than MRQ 76 for both seasons (*Figure 1b*). Panicle number recorded by MRQ 74 during MS 2012/2013 and OS 2013 was 41.35 and 25.79%, respectively, higher than MRQ 76.

The reduction of yield in MRQ 76 during MS 2012/2013 may be due to high incidence of panicle blast and sheath blight diseases. Generally, rice diseases may result in yield reduction of 10 – 15% in tropical Asia (Savary et al. 2000). Blast and sheath blight are two diseases that responsible for yield losses of 5% or more. Supaad et al. (1980) reported that yield reduction of 50 – 70% occurred due to blast epidemics in Malaysia and Philippines. In 1993, 15 – 20% of the total rice area is estimated to be infected with sheath blight disease with losses of 17 – 25% occurred. Rice blast is well known to cause severe yield losses in rice production because when the fungus hits the rice head or neck, it may stops nutrients and water from getting to the panicles and this will lead to production of empty grains. Severe infestations may lead to large areas of dead plants. Sheath blight disease may interrupt the flow of water and nutrients in the rice plant and the leaf dies followed by reduction in grain yield.

Result also showed that the interaction between season x organic fertiliser on yield and number of spikelet per panicle was significant. The yield obtained during OS 2013 was higher than MS 2012/2013 for all treatment tested including control treatment (*Figure 2a*). However, in this season, the yield between treatments was slightly constant including control. This indicated that organic fertiliser may just play a supplementary role, but not as sole nutrient source as far as high rice yield production is concerned. Virmani and Esawaran (1990) suggested that the potential of the high-yielding irrigated lowland varieties was not maximised by the use of organic fertilisers alone. Balancing the inorganic fertilisers with organic materials or with inorganic micronutrients can further increase grain yield production. Javier et al. (2002) reported that after six continuous rice cropping seasons (three wet and three dry), all the organic treated plants regardless of organic fertiliser sources had higher average yields than the untreated plants.

In MS 2012/2013, number of spikelet per panicle increased when organic fertiliser at the rate up to 2,000 kg/ha was given to the plant (*Figure 2b*). However, increasing in number of spikelet per panicle did not contribute to yield because yield reduction can be seen when organic fertiliser at that particular rate was applied to the plant. Application of organic fertiliser at a higher rate during MS 2012/2013 encouraged the incidence of rice disease and indirectly affected the yield (*Table 3*).

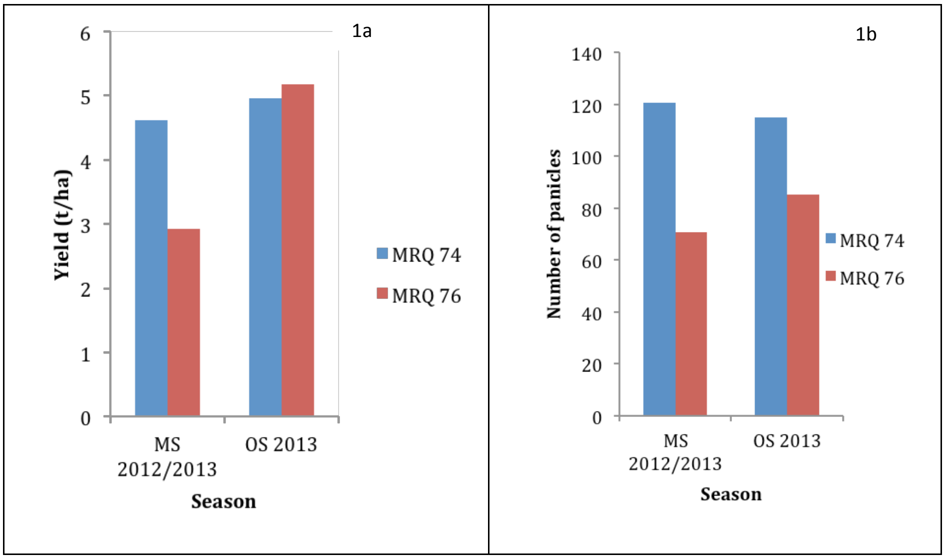


*Figure 1. Influence of variety and season on yield (1a), number of panicles (1b)*

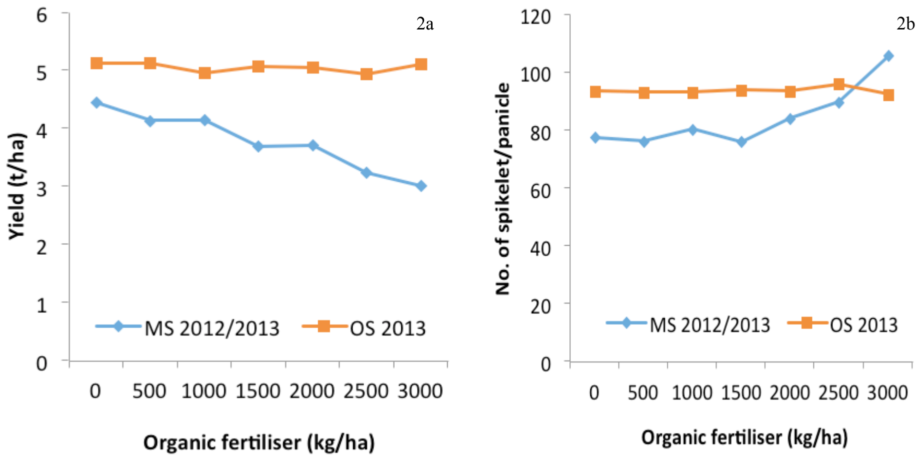


*Figure 2. Influence of organic fertiliser and season on yield (2a) and number of spikelet per panicle (2b) of MRQ 74 and MRQ 76*

Table 3. Mean square value and analysis of ANOVA for effects of organic fertiliser on disease incidence of MRQ 74 and MRQ 76 during MS 2012/2013 and OS 2013

| Factor | Disease incidence | | |
|---|---|---|---|
| | Panicle blast | Sheath blight | False smut |
| Season (S) | 1.80[z]** | 168.32** | 0.0009* |
| Replication (R) | 0.05* | 9.54** | 0.0003ns |
| R(S) | 0.05* | 9.54** | 0.0003ns |
| Variety (V) | 1.23** | 3.68* | 0.0003ns |
| Organic fertiliser (O) | 0.02ns | 3.68* | 0.0004ns |
| S x V | 1.23** | 3.68* | 0.0003ns |
| S x O | 0.02ns | 0.70ns | 0.0004ns |
| S x V x O | 0.02ns | 0.42ns | 0.0005ns |
| V x O | 0.02ns | 0.42ns | 0.0003ns |
| CV (%) | 10.76 | 13.32 | 15.65 |

[z]Mean separation within columns and treatments by Duncan multiple's range test
ns, *, **Non-significant, significant at ($p \leq 0.05$) and ($p \leq 0.01$), respectively

***Disease incidence***

A total of three fungal rice diseases were recorded in this study namely panicle blast, sheath blight and false smut. Results showed that there were significant interaction between season x variety on panicle blast and sheath blight (*Table 3*). In MS 2012/2013, panicle blast and sheath blight diseases were appeared in both varieties. The percentage of panicle blast and sheath blight diseases recorded for MRQ 76 was 91.3 and 25.6%, respectively, higher than MRQ 74 (*Figure 3a and 3b*). However, in OS 2013, no disease incidence was recorded for both MRQ 74 and MRQ 76.

*Figure 4* also shows that application of organic fertiliser at a higher rate promotes the incidence of sheath blight disease in fragrant rice cultivation. Result showed that incidence of the disease increased by 39.7% when plot was applied with 3,000 kg/ha organic fertiliser compared to the control. Liu et al. (1990) stated that the use of organic fertilisers in addition to chemical fertiliser increases soil organic matter and total nitrogen and as well as increases the effectiveness of soil phosphorous.

Other than N factor, the establishment of the disease depended largely on favourable environment conditions such as temperature, relative humidity and rainfall intensity. Allicia et al. (2013) found that in the MS 2012/2013, the rainfall intensity was higher from October – December 2012 and the number of rainy days recorded was more than 15 days each month in Seberang Perai. However, the rainfall intensity recorded from May till July was very low with the number of rainy days recorded were less than 10 days which indicate dry period.

Dobermann and Fairhust (2000) stated that the infection rate of blast disease in paddy field tend to increase due to increase in humidity while Luo et al. (1998) found that changes of temperature between +3 $^{o}$C in the ambient air significantly increases the yield losses due to severe blast infestation.

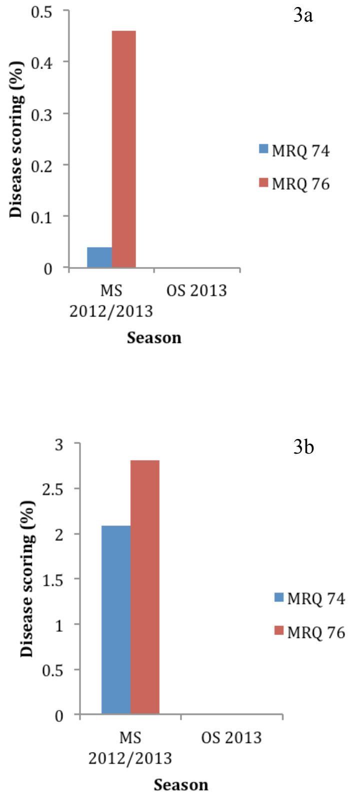


*Figure 3. Influence of variety and season on panicle blast (3a) and sheath blight disease (3b)*

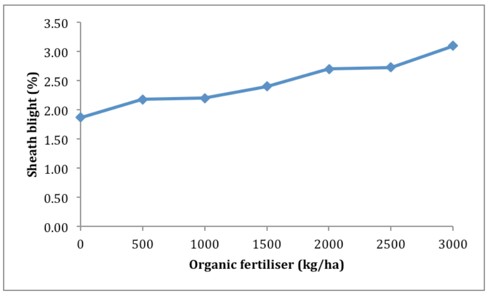


*Figure 4. Incidence of sheath blight disease as influenced by organic fertiliser during MS 2012/2013*

***Correlation analysis***

Analysis of correlation shows the relationship between yield, yield components and disease percentage of MRQ 74 during MS 2012/2013 and OS 2013 (*Table 4 and 5*). In MS 2012/2013, the yield of MRQ 74 was positively correlated with number of panicle and percentage of filled grain but negatively correlated with percentage of panicle blast (*Table 4*). As number of panicle and percentage of filled grain increased, the yield was also increased, but when percentage of blast increased, the yield decreased. The increase in number of panicle might be due to increase in number of productive tillers, while the increase in the density of the grain maybe compensated with other yield components such as number of spikelet and 1,000-grain weight. Negative correlation between yield and panicle blast disease revealed that reduction of yield during this season was significantly affected by incidence of panicle blast.

Result showed that all parameters did not correlate with each other except for number of panicle and number of spikelet per panicle during OS 2013 for MRQ 74 (*Table 5*). Negative correlation between these two parameters shows that they compensated for each other.

The yield of MRQ 76 was positively correlated with percentage of filled grain and 1,000-grain weight but it was negatively correlated with number of spikelet per panicle and percentage of sheath blight during MS 2012/2013 (*Table 6*). The yield increased as percentage of filled grain and 1,000-grain weight increased, but incidence of sheath blight disease affected the yield negatively.

In OS 2013, the yield was highly correlated with percentage of filled grain but did not correlate with other parameters (*Table 7*).

Table 4. Correlation coefficients (r) between yield, number of panicle, number of spikelet per panicle, percentage of filled grain, 1,000-grain weight, panicle blast, sheath blight and false smut of MRQ 74 grown during MS 2012/2013

| | Yield | Number of panicle | Number of spikelet/ panicle | Filled grain (%) | 1,000-grain weight | Panicle blast | Sheath blight | False smut |
|---|---|---|---|---|---|---|---|---|
| Yield | – | 0.43* | –0.15ns | 0.55** | 0.18ns | –0.48** | –0.36ns | 0.07ns |
| Number of panicle | 0.43* | – | –0.40* | 0.30ns | –0.20ns | –0.37ns | –0.21ns | 0.34ns |
| Number of spikelet/panicle | –0.15ns | –0.40* | – | –0.32ns | 0.35ns | 0.01ns | 0.09ns | –0.24ns |
| Filled grain (%) | 0.55** | 0.30ns | –0.32ns | – | 0.04ns | –0.08ns | –0.27ns | 0.01ns |
| 1,000-grain weight | 0.18ns | –0.20ns | 0.35ns | 0.04ns | – | 0.27ns | 0.05ns | –0.06ns |
| Panicle blast | –0.48** | –0.37ns | 0.01ns | –0.08ns | 0.27ns | – | 0.02ns | –0.09ns |
| Sheath blight | –0.36ns | –0.21ns | 0.09ns | –0.27ns | 0.05ns | 0.02ns | – | 0.22ns |
| False smut | 0.07ns | 0.34ns | –0.24ns | 0.01ns | –0.06ns | –0.09ns | 0.22ns | – |

ns, *, ** Non-significant, significant at $p \leq 0.05$ or 0.01

Table 5. Correlation coefficients (r) between yield, number of panicle, number of spikelet per panicle, percentage of filled grain and 1,000-grain weight of MRQ 74 grown during OS 2013

| | Yield | Number of panicle | Number of spikelet/ panicle | Filled grain (%) | 1,000-grain weight |
|---|---|---|---|---|---|
| Yield | – | 0.27ns | 0.001ns | 0.19ns | –0.002ns |
| Number of panicle | 0.27ns | – | –0.45* | 0.77ns | –0.03ns |
| Number of spikelet/panicle | 0.001ns | –0.45* | – | –0.30ns | –0.21ns |
| Filled grain (%) | 0.19ns | 0.77ns | –0.30ns | – | 0.19ns |
| 1,000-grain weight | –0.002ns | –0.03ns | –0.21ns | 0.19ns | – |

ns, *Non-significant, significant at $p \leq 0.05$

Table 6. Correlation coefficients (r) between yield, number of panicle, number of spikelet per panicle, percentage of filled grain, 1,000-grain weight, panicle blast, sheath blight and false smut of MRQ 76 grown during MS 2012/2013

| | Yield | Number of panicle | Number of spikelet/ panicle | Filled grain (%) | 1,000-grain weight | Panicle blast | Sheath blight | False smut |
|---|---|---|---|---|---|---|---|---|
| Yield | – | 0.30ns | –0.40* | 0.54** | 0.46* | –0.28ns | –0.61** | 0.19ns |
| Number of panicle | 0.30ns | – | –0.40* | 0.21ns | –0.08ns | –0.32ns | –0.27ns | –0.12ns |
| Number of spikelet/ panicle | –0.40* | –0.40* | – | –0.34ns | –0.17ns | 0.22ns | 0.26ns | 0.19ns |
| Filled grain (%) | 0.54** | 0.21ns | –0.34ns | – | 0.18ns | –0.35ns | –0.51** | 0.14ns |
| 1,000-grain weight | 0.46* | –0.08ns | –0.17ns | 0.18ns | – | 0.01ns | –0.20ns | 0.47* |
| Panicle blast | –0.28ns | –0.32ns | 0.22ns | –0.35ns | 0.01ns | – | 0.09ns | –0.11ns |
| Sheath blight | –0.61** | –0.27ns | 0.26ns | –0.51** | –0.20ns | 0.09ns | – | –0.07ns |
| False smut | 0.19ns | –0.12ns | 0.19ns | 0.14ns | 0.47* | –0.11ns | –0.07ns | – |

ns, *, ** Non-significant, significant at $p \leq 0.05$ or 0.01

Table 7. Correlation coefficients (r) between yield, number of panicle, number of spikelet per panicle, percentage of filled grain and 1,000-grain weight of MRQ 76 grown during OS 2013

| | Yield | Number of panicle | Number of spikelet/ panicle | Filled grain (%) | 1,000-grain weight |
|---|---|---|---|---|---|
| Yield | – | 0.16ns | 0.25ns | 0.54* | –0.05ns |
| Number of panicle | 0.16ns | – | –0.35ns | 0.05ns | –0.03ns |
| Number of spikelet/panicle | 0.25ns | –0.35ns | – | –0.13ns | –0.01ns |
| Filled grain (%) | 0.54* | 0.05ns | –0.13ns | – | –0.06ns |
| 1,000-grain weight | –0.05ns | –0.03ns | –0.01ns | –0.06ns | – |

ns, *Non-significant, significant at $p \leq 0.05$

## Conclusion

The study revealed that the yield obtained through application of organic fertiliser was closely related to planting season and variety used. In MS 2012/2013, the yield reduction of both varieties can be seen clearly and it was related to the incidence of panicle blast and sheath blight diseases. However, no disease incidence was recorded during OS 2013, thus indicating that in MS 2012/2013, prevention of major disease must be of greater concern. The effectiveness of organic fertiliser as a basal fertiliser to increase the yield was not promising and this study needs to be extended to a longer cropping season.

## Acknowledgement

The authors gratefully acknowledged the technical assistance of Ms. Surya Mohamad and Mr. Mohamad Arif Asrof during this trial.

## References

Allicia, J., Habibuddin, H., Mohd. Fadil, M.Y., Noor Azlina, M., Shahida, H. and Siti Norsuha, M. (2013). Meteorological factors and airborne spore population dynamic of *Pyricularia oryzae* in blast disease epidemiology. Poster presented at MARDI Science and Technology Exhibition 2013. MAEPS, Serdang, Selangor

Azmi, M., Alias, I., Abu Hassan, D., Ayob, A.H., Azmi, A.R., Badrulhadza, A., Maisarah, M.S., Muhammad, H., Othman, O., Saad, A., Sariam, O., Siti Norsuha, M., Syahrin, S. dan Yahaya, H. (2008). *Manual Teknologi Penanaman Padi Lestari.* 1st edition, 54 p. Serdang: MARDI

Balasubramaniam, V., Morales, A.C., Cruz, R.T. and Abdulrachman, S.C. (1999). On-farm adaptation of knowledge-intensive nitrogen management technologies for rice systems. *Nutr. Cycle Agroecosyst*. 53: 59 – 69

Balasubramaniam, V., Morales, A.C., Cruz, R.T., Thiyagarajan, M., Nagarajan, R., Babu, M. and Hei, L.H. (2000). Adaptation for real-time N management in rice: A review. *Intl. Rice Res. Notes* 25: 4 – 8

BERNAS. (2008). Jadual import beras pada tahun 2000 hingga 2007. BERNAS database (unpublished)

Chau, L.M. and Heong, K.L. (2005). Effects of organic fertilizers on insect pest and diseases of rice. *Omonrice* 13: 26 – 33

Dobermann, A. and Fairhust, T. (2000). *Rice: Nutrient disorders and nutrient management*, 1st edition. p. 40 – 117. Potash and Phosphate Institute (PPI), Potash and Phosphate Institute of Canada (PPIC) and International Rice Research Institute (IRRI)

FFTC publication database. (1998). Food and Fertilizer Technology Centre Taiwan Microbial and Organic Fertilizers in Asia

Huang, J., He, F., Cui, K., Roland, J., Buresh, B.X., Gong, W. and Peng, S. (2008). Determination of optimal nitrogen rate for rice varieties using a chlorophyll meter. *Field Crops. Res*. 105: 70 – 80

Javier, E.F., Marquez, J.M., Grospe, F.S., Mamucod, H.F. and Tabica, R.E. (2002). Three years effect of oganic fertilizer use on paddy rice. *Philippines Journal of Crops Science* 27(2): 11 – 15

Liu, J.R., Zhang, D.Y. and Zhow, W. (1990). The effect of mixed application of organic and inorganic fertilizers to paddy soil (third report). *Acta Agriculturae Universities Jiangxiensis* 12(1): 37 – 42

Luo, Y., Teng, P.S., Fabellar, N.G. and TeBeest, D.O. (1998). Risk analysis of yield losses caused by rice leaf blast associated with temperature changes above and below for five Asian countries. *Agric. Ecosyst. Environ.* 68: 197 – 205

Miller, H.B. (2007). Poultry litter induces tillering in rice. *Journal of Sustainable Agriculture* 31: 1 – 12

Mirza Hasanuzzaman, K.U., Ahamed, N.M., Rahmatullah, N., Akhter, K.N. and Rahman, M.L. (2010). Plant growth characters and productivity of wetland rice (*Oryza sativa L.*) as affected by application of different manures. *Emir. J. Food Agric*. 22(1): 46 – 58

Mohamad Najib, M.Y., Norziana, Z.Z., Haryati, M., Zulkefli, M. and Asfaliza, R. (2013). Potensi baja organik yang diperkaya untuk peningkatan hasil tanaman padi (MRQ 74). *Proceedings Padi 2013*,10 – 12 Dec 2013, Seberang Perai, Penang, (Marzuki et al., ed.), p. 550 – 554. Serdang: MARDI

Morteza, S., Alireza, N. and Shankar, L.L. (2011). Effect of organic fertilizer on growth and yield components in rice. *Journal of Agricultural Science* 3(3): 217 – 224

Peng, S., Garcia, F.V., Laza, R.C. and Cassman, K.G. (1993). Adjustment for specific leaf weight improves chlorophyll meter's estimate of rice leaf nitrogen concentration. *Agron. J.* 85: 987 – 990

Peng, S., Garcia, F.V., Laza, R.C., Sanico, A.L., Visperas, R.M. and Cassman, K.G. (1996). Increased N-use efficiency using a chlorophyll meter on high yielding irrigated rice. *Field Crops Res.* 47: 243 – 252

Ramesh, P., Singh, M. and Subba Rao, A. (2005). Organic farming: Its relevance to the Indian context. *Current Scientist* 88(4): 561 – 568

SAS Institute (2011). *SAS Procedures Guide*, Version 9.3, 2nd edition. Cary: SAS Institute

Savary, S., Willocquet, L., Elazegui, F.A., Castilla, N.P. and Teng, P.S. (2000). Rice pest constraints in tropical Asia: quantification of yield losses due to rice pests in a range of production situations. *Plant Dis.* 84(3): 357 – 369

Supaad, M.A., Saad, A. and Chin, K.M. (1980). Control of some rice diseases, with special reference to rice blast in Peninsular Malaysia. Proceedings of the National Rice Conference 1980, 26 – 28 Feb 1980, Kuala Lumpur, p. 230 – 241. Serdang: MARDI

Virmani, S.M. and Eswaran. H. (1990). Charaterization of the environment for sustainable agriculture in semi-arid tropics. *Proceedings of the International Symposium on Natural Resources Management for a Sustainable Agriculture,* 10 Feb 1990, New Delhi, (Sing, R.P., ed.), p. 1 – 8. New Delhi: Indian Society of Agronomy

**Abstrak**
Kesan baja organik sebagai baja asas terhadap prestasi dan insiden penyakit bagi varieti padi wangi tempatan, MRQ 74 dan MRQ 76 telah dikaji semasa musim utama 2012/2013 (MS 2012/2013) dan musim luar 2013 (OS 2013). Baja organik pada kadar 500, 1,000, 1,500, 2,000, 2,500 dan 3,000 kg/ha yang masing-masing bersamaan dengan 25, 50, 75, 100, 125 dan 150 kg N/ha telah digaul ke dalam tanah seminggu sebelum anak pokok diubah secara manual. Tiada baja organik digunakan dalam kawalan. Keputusan menunjukkan baja organik menyumbang kepada bilangan anak pokok dan nilai SPAD. Nilai SPAD meningkat sebanyak 20% apabila baja organik pada kadar lebih 1500 kg/ha diaplikasikan pada pokok. Bilangan anak pokok yang lebih tinggi diperhatikan apabila baja organik pada kadar 2,000 kg/ha diberi sebagai baja asas. Hasil dipengaruhi oleh musim dan kadar baja organik. Hasil MRQ74 adalah 57.34% lebih tinggi daripada MRQ 76 semasa MS 2012/2013. Hasil yang direkodkan semasa OS 2013 adalah lebih tinggi berbanding dengan MS 2012/2013 bagi kesemua kadar baja organik yang diuji termasuk kawalan. Aplikasi baja organik sehingga 3,000 kg/ha menggalakkan kejadian penyakit hawar seludang yang meningkat sebanyak 39.7% berbanding dengan kawalan.