The phenotypic performance and correlations analyses of six promising lines red rice grown on the paddy field

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Abstract. Red rice is an essential food and has nutritional content, but farmers' production and interest in red rice cultivation are still relatively low. One effort to develop and increase brown rice production is planting superior varieties with selection efficiency. The purpose of this study was to determine the correlation between yield components and yields of the six promising lines of red rice in paddy fields and to know the yield components that were positively correlated very significantly to the results in paddy fields. The research design used was a randomized block design (RBD) consisting of 6 crosses, namely GS11-1, GS11-2, GS12-1, GS12-2, GS44-1, GS44-2, and one comparison variety, Trisakti. The results of the analysis show that there were two components of yield that were highly positively correlated with yields of red rice, which were positively correlated significantly, including the number of productive tillers with grain yield per clump (0.83 **) and the weight of 1000 grains with grain yield (0.57 **).

1. Introduction

Rice, beside as source of carbohydrate and still dominant as staple food. Rice also has a role as a functional food because its content of antocyanine and important for healthy life [1-3]. Government has effort to increase rice production, to fullfile the rice that always increase every year. The program to increase rice production included provide better seed [4-6], expanded farming system [7-11], develop high yielding new breeding variety through irradiance technique [12-14], hybridization [15-18], and hybrid variety [19-20]. Another program to increase rice production by fertilizing using organic fertilizer application of biological fertilizers of non symbiotic fixing-nitrogen as Azotobacter sp and Azospirillum sp [21-26]. On other side also chasing by decreasing rice level consumption and development of alternative food [27]. Various efforts to increase rice production are mainly carried out by assembling new varieties. The assembly is carried out to obtain superior varieties. The development of improved varieties can improve rice productivity through plant breeding programs. The promising lines of rice cultivar have been assembled through crossbreeding between local upland rice and paddy cultivar [18,28]. Furthermore, these red rice crossbreed lines need to be tested in the rice production center's adaptation area to assess the potential yield and the ability to adapt in upland and paddy fields. The knowledge about the relationship between yield and its related traits is needed for an efficient selection strategy for the plant breeders to evolve an economic variety.
2. Materials and methods
The research was carried out in community-owned rice fields in Renomeeto Village, West Ranomeeto District, South Konawe Regency. The rice cultivar used in this experiment resulted from a cross between upland rice and lowland rice. The research design used was a randomized block design (RBD) consisting of 6 crosses, namely GS11-1, GS11-2, GS12-1, GS12-2, GS44-1, GS44-2, and one comparison variety, Trisakti. Each treatment was repeated three times. The parameters observed including tiller number, flag leaf angle, flag leaf area, panicle length, days to 50% flowering, days to maturity, total grain per panicle, filled grain percentage, thousand-grain weight and yield per hill.

3. Results and discussion

3.1. Field performance
The result findings of a phenotypic study of six promising rice lines presented in table 1. The six rice promising lines were higher than the check variety based on the phenotypic results, almost all of the phenotypic performance. The GS44-1 lines reported 1000 grains and days to 50 percent flowering as the highest weight, followed by the GS44-2 line and GS11-1 lines.

Table 1. The phenotypic performance of 6 promising lines and check variety.

| Traits      | GS11-1 | GS11-2 | GS12-1 | GS12-2 | GS44-1 | GS44-2 | Check Variety |
|-------------|--------|--------|--------|--------|--------|--------|---------------|
| FLW         | 43.59a | 44.20a | 42.90a | 40.34ab| 38.59ab| 40.98ab| 28.80b        |
| FLA         | 12.42ab| 12.11ab| 12.64a | 12.09ab| 11.93ab| 11.57ab| 10.24b        |
| PL          | 23.83a | 23.53a | 25.27a | 24.17a | 24.83a | 25.10a | 20.37b        |
| DTF         | 69.00ab| 69.67a | 67.67b | 70.67a | 70.67a | 70.00a | 54.00c        |
| DTM         | 100.00b| 100.00b| 104.00a| 104.00a| 104.00a| 104.00a| 84.00c        |
| GT/P        | 128.18b| 126.53b| 166.69a| 144.75ab| 141.17ab| 146.64ab| 75.08c        |
| FG/P        | 76.02bc| 73.54bc| 79.06ab| 79.32ab| 76.34bc| 68.49c | 86.93a        |
| TGW         | 28.55ab| 26.92b | 26.05b | 26.79b | 30.74a | 28.58ab| 26.50b        |

Remark: FLW- Flag leaf area, FLA- Flag leaf angle, PL- Panicle length, DTF- Days to 50% flowering, DTM- Days to maturity, GT/P- Grain total per panicle, FG/P- Filled grain percentage, TGW- Thousand-grain weight. Number in the same colour follow by the same superscript (a,b,c) was no significant difference in DMRT 0.05.

3.2. Correlation coefficient analysis
The results of the analysis show that there is a correlation between various components of growth and plant production on the main crop yield in the form of grain yield per hill (table 2).

Table 2. Coefficient correlation for yield-related traits of eight promising lines of red rice evaluated

| Traits  | TN   | FLA  | FLW  | PL   | DTF  | DTM  | GT/P  | FG/P  | TGW  | GY   |
|---------|------|------|------|------|------|------|-------|-------|------|------|
| TN      | 1    |      |      |      |      |      |       |       |      |      |
| FLA     | 0.16 | 1    |      |      |      |      |       |       |      |      |
| FLW     | -0.14| -0.07| 1    |      |      |      |       |       |      |      |
| PL      | -0.07| 0.51*| 0.43 | 1    |      |      |       |       |      |      |
| DTF     | 0.02 | 0.64**| -0.03 | 0.82**| 1    |      |       |       |      |      |
| DTM     | -0.05| 0.63**| 0.17 | 0.91**| 0.95**| 1    |       |       |      |      |
| GT/P    | -0.16| 0.52*| 0.44*| 0.91**| 0.76**| 0.90**| 1    |       |      |      |
| FG/P    | -0.13| -0.47*| -0.12 | -0.59**| -0.69**| -0.64**| -0.52*| 1    |      |      |
| TGW     | 0.41 | -0.02| -0.18 | 0.31 | 0.35 | 0.28*| 0.08  | -0.22 | 1    |      |
| GY      | 0.83**| 0.36 | 0.04 | 0.39 | 0.4  | 0.41 | 0.35  | -0.25 | 0.57**| 1    |
Remark: **TN**- Tillering number, **FLA**- Flag leaf angle, **FLW**- Flag leaf area, **PL**- Panicle length, **DTF**- Days to 50% flowering, **DTM**- Days to maturity, **GT/P**- Grain total per panicle, **FG/P**- Filled grain percentage, **TGW**- Thousand-grain weight, **GY**- Grain yield per hill (Number on the same column follow by * has a significant correlation and follow by ** has a very significant correlation).

The results of the analysis based on Pearson’s correlation show that there are several components of the results that have a positive correlation with grain yields, including tiller number (0.83), flag leaf angle (0.36), panicle length (0.39), days to 50% flowering (0.4), days to maturity (0.41), grain total per panicle (0.35) and thousand-grain weight (0.57). However, based on table 2, it also appears that the yield components that have a significant positive correlation are only the parameters of the number of productive tillers and the weight of 1000 grains. The productive tiller number and thousand-grain weight are considered as an important component for realizing high yield because it exhibited a significant and positive association with grain total per hill. The difference of 1000 grains weight of each treatment is genetically derived from each of the different rice lines traits and is genetic properties.

4. Conclusion
It’s concluded that the number productive tiller and weight of 1000 grains have positively correlated with grain yield per clump. The rice promising lines (GS44-1 and GS44-2) have better performances in component of yield.

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