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## Morpho-physiological variation and yield response of rice genotypes under rainfed and irrigated conditions

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### Abstract

Drought is one of the major constraints limiting rice productivity, particularly under rainfed production systems. The present study was conducted to evaluate the morpho-physiological responses and yield performance of rice genotypes under rainfed and irrigated conditions. Thirty rice genotypes, along with the check variety Poornima (LC), were evaluated during the Kharif season of 2019–20 at the Research Cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The experiment was conducted in a randomized block design with three replications. Twelve important traits, including plant height, number of tillers hill<sup>-1</sup>, leaf area index, crop growth rate, relative water content, total dry matter, panicles m<sup>-2</sup>, grains panicle<sup>-1</sup>, grains m<sup>-2</sup>, test weight, grain yield and harvest index, were assessed. Irrigated conditions generally produced higher values for all growth, physiological and yield-related traits than rainfed conditions. Under rainfed conditions, Poornima (LC) recorded the highest grain yield (40.21 q ha<sup>-1</sup>), followed by RFU 329 (35.23 q ha<sup>-1</sup>), while RFU 323 recorded the lowest yield (21.26 q ha<sup>-1</sup>). Poornima (LC) and RFU 329 also showed comparatively better performance for several morpho-physiological traits under moisture stress. The study indicates that these genotypes possess better adaptation to water-limited conditions and may serve as useful material for further evaluation and breeding for drought tolerance in rice.

**Keywords:** Rice, drought tolerance, rainfed condition, irrigated condition, morpho-physiological traits, yield, moisture stress

### 1. Introduction

Rice (*Oryza sativa* L.) is an important food crop, but its productivity is strongly affected by drought, particularly in rainfed production systems. Water deficit can adversely affect plant growth, water status, biomass accumulation, reproductive development and grain yield. The severity of drought effects varies among genotypes, making the identification of drought-tolerant genotypes important for stable rice production.

Traits such as plant height, tillering, leaf area index, crop growth rate, total dry matter and relative water content provide useful information about plant performance under moisture stress. Similarly, yield attributes such as panicle number, grains per panicle, test weight and harvest index contribute to final grain yield. Evaluation of these traits under contrasting moisture regimes can therefore help identify genotypes with better drought adaptation.

The present study was undertaken to evaluate morpho-physiological traits, yield attributes and grain yield of rice genotypes under rainfed and irrigated conditions and to identify traits associated with better performance under water-limited conditions.

### 2. Materials and Methods

The present study was conducted at the Research Cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, during the Kharif season of 2019–20. Thirty rice (*Oryza sativa* L.) genotypes obtained from IIRR, Hyderabad, under the AICRP on Rice programme, along with the check variety Poornima (LC), were evaluated under rainfed and irrigated conditions. The field experiment was laid out in a randomized block design with three replications. The experimental plot size was 3.80 × 1.40 m, with a spacing of 20 × 20 cm. A fertilizer dose of 100:45:60 kg N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O ha<sup>-1</sup> was applied, with phosphorus and potassium applied as basal and nitrogen applied in three splits.

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Under rainfed conditions, no artificial irrigation was provided after crop establishment until maturity, whereas irrigation was supplied according to crop requirement under irrigated conditions. Observations were recorded on morpho-physiological traits, including plant height, number of tillers hill<sup>-1</sup>, leaf area index, crop growth rate, total dry matter and relative water content. Yield and yield attributes included number of panicles m<sup>-2</sup>, grains panicle<sup>-1</sup>, test weight, grain yield and harvest index. Plant height was recorded at flowering, while tillers were counted during panicle initiation and flowering. Leaf area index, crop growth rate and total dry matter were determined following the procedures described in the original study, and relative water content was estimated from fresh, turgid and dry weights of leaves.

Yield attributes were recorded after harvesting. The number of panicles m<sup>-2</sup> and grains panicle<sup>-1</sup> were determined by counting, while test weight was recorded from 1000 healthy grains. Grain yield was recorded from the harvested produce, and harvest index was calculated from grain and total panicle biomass. The data were subjected to analysis of variance (ANOVA) following Gomez and Gomez (1984), and treatment differences were tested at the 5% probability level. Correlation coefficients were also calculated among selected traits.

### 3. Results and Discussion

#### 3.1 Plant height

Plant height was consistently higher under irrigated conditions than under rainfed conditions. The mean plant height was 107.63 cm under irrigated conditions compared with 97.46 cm under rainfed conditions. Among the genotypes, RFU 329 recorded the highest plant height under both irrigated (120.00 cm) and rainfed (110.00 cm) conditions, whereas RFU 305 recorded the lowest values (95.00 and 81.00 cm, respectively). The reduction in plant height under water stress may be attributed to reduced cell division, cell expansion and turgor pressure under limited water availability. Similar findings were reported by Singh *et al.* (2018) [10].

#### 3.2 Number of tillers hill<sup>-1</sup>

The number of tillers hill<sup>-1</sup> was also higher under irrigated conditions. The mean number of tillers was 31.59 hill<sup>-1</sup> under irrigation and 24.55 hill<sup>-1</sup> under rainfed conditions. RFU 329 produced the maximum number of tillers under irrigation (35.00), while RFU 327 and RFU 329 recorded the highest value under rainfed conditions (27.00). Water stress reduced tiller production, probably because restricted water availability limits vegetative growth and photosynthetic activity. The present results were in agreement with Prathi *et al.* (2018) [7] and Singh *et al.* (2018) [10].

#### 3.3 Leaf area index

Leaf area index (LAI) was substantially affected by moisture availability. The mean LAI at tillering and flowering stages was 2.90 and 5.90 under irrigated conditions, respectively, compared with 1.60 and 3.59 under rainfed conditions. The reduction in LAI under water stress indicates restricted leaf expansion and canopy development, which can reduce the photosynthetic surface and consequently biomass accumulation. The findings were consistent with observations reported by Zain *et al.* (2014) [11], Kumar *et al.* (2015) [3], Pandey and Shukla (2015) [4] and Sahoo *et al.* (2020) [8].

#### 3.4 Crop growth rate

Crop growth rate (CGR) was significantly reduced under rainfed conditions compared with irrigation. The genotype-wise CGR

ranged from 4.07–19.30 g m<sup>-2</sup> day<sup>-1</sup> under rainfed conditions and 7.00–23.67 g m<sup>-2</sup> day<sup>-1</sup> under irrigated conditions. Poornima (LC) recorded the highest CGR under both moisture regimes, followed by RFU 329. The lower CGR under water stress reflects reduced biomass accumulation resulting from restricted photosynthesis and plant growth. Similar results were reported by Joshi *et al.* (2018) [1].

#### 3.5 Relative water content

Relative water content (RWC) was markedly higher under irrigated conditions than under rainfed conditions. The genotype-wise RWC ranged from 17.12–45.54% under rainfed conditions, compared with 33.22–63.36% under irrigation. Poornima (LC) recorded the highest RWC under rainfed conditions (45.54%), followed by RFU 329 (43.00%), whereas RFU 317 recorded the lowest value (17.12%). The lower RWC under water stress indicates reduced plant water status and reflects the effect of drought on cellular hydration. Similar results were reported by Sahoo *et al.* (2019) [9].

#### 3.6 Total dry matter

Total dry matter production was significantly reduced under rainfed conditions. The genotype-wise total dry matter ranged from 630.09–849.54 g m<sup>-2</sup> under rainfed conditions and 726.12–921.84 g m<sup>-2</sup> under irrigation. RFU 301 recorded the lowest total dry matter under rainfed conditions (630.09 g m<sup>-2</sup>), whereas Poornima (LC) recorded the highest (849.54 g m<sup>-2</sup>), followed by RFU 329 (802.37 g m<sup>-2</sup>). The reduction in dry matter under water stress may be associated with restricted leaf development, photosynthesis and assimilate accumulation. Similar trends were reported by Kumar *et al.* (2014) [2].

#### 3.7 Number of panicles m<sup>-2</sup>

The number of panicles m<sup>-2</sup> was significantly higher under irrigated conditions. Under rainfed conditions, genotype values ranged from 339.00 to 480.33 panicles m<sup>-2</sup>, compared with 378.66 to 510.03 panicles m<sup>-2</sup> under irrigation. RFU 313 recorded the lowest number of panicles under rainfed conditions, whereas Poornima (LC) recorded the highest (480.33), followed by RFU 329 (431.23). The reduction in panicle number under drought stress indicates the adverse effect of water limitation on tiller survival and reproductive development. Similar results were reported by Joshi *et al.* (2018) [1].

#### 3.8 Number of grains panicle<sup>-1</sup>

The number of grains panicle<sup>-1</sup> was significantly reduced under rainfed conditions. Genotype values ranged from 91.00 to 178.00 grains panicle<sup>-1</sup> under rainfed conditions, compared with 112.00 to 203.00 grains panicle<sup>-1</sup> under irrigation. RFU 323 recorded the lowest number of grains under rainfed conditions, while Poornima (LC) recorded the highest (178.00), followed by RFU 329 (169.00). Reduced grain number under water stress may be associated with impaired reproductive development and increased spikelet sterility. Similar findings were reported by Kumar *et al.* (2014) [2] and Singh *et al.* (2018) [10].

#### 3.9 Number of grains m<sup>-2</sup>

Grain number per unit area was substantially reduced under rainfed conditions. The genotype values ranged from 31,631 to 85,796 grains m<sup>-2</sup> under rainfed conditions, whereas the corresponding range under irrigation was 43,564 to 103,462 grains m<sup>-2</sup>. RFU 323 recorded the lowest grain number under rainfed conditions, while Poornima (LC) recorded the highest (85,796 grains m<sup>-2</sup>), followed by RFU 329 (77,567 grains m<sup>-2</sup>).

The reduction in grains  $\text{m}^{-2}$  under drought was associated with reductions in both panicle number and grains  $\text{panicle}^{-1}$ . Similar results were reported by Pantuwan *et al.* (2004)<sup>[6]</sup> and Kumar *et al.* (2015)<sup>[3]</sup>.

### 3.10 Test weight

Test weight was significantly reduced under water stress. Genotype values ranged from 10.64 to 27.31 g under rainfed conditions, compared with 17.29 to 32.71 g under irrigation. RFU 319 recorded the lowest test weight under rainfed conditions (10.64 g), whereas Poornima (LC) recorded the highest (27.31 g), followed by RFU 329 (25.42 g). Reduced grain filling and grain development under water stress may contribute to lower test weight. Similar findings were reported by Pantuwan *et al.* (2000)<sup>[5]</sup>, Kumar *et al.* (2015)<sup>[3]</sup>, Singh *et al.* (2018)<sup>[10]</sup>.

### 3.11 Grain yield

Grain yield was significantly higher under irrigated conditions than under rainfed conditions. Genotype-wise grain yield ranged from 21.26 to 40.21  $\text{q ha}^{-1}$  under rainfed conditions, compared

with 27.01 to 51.34  $\text{q ha}^{-1}$  under irrigation. Poornima (LC) recorded the highest grain yield under rainfed conditions (40.21  $\text{q ha}^{-1}$ ), followed by RFU 329 (35.23  $\text{q ha}^{-1}$ ), whereas RFU 323 recorded the lowest yield (21.26  $\text{q ha}^{-1}$ ). The reduction in grain yield under drought may be associated with reduced dry matter accumulation, grain number and reproductive development. Similar results were reported by Kumar *et al.* (2014)<sup>[2]</sup> and Singh *et al.* (2018)<sup>[10]</sup>.

### 3.12 Harvest index

Harvest index differed significantly between moisture regimes and was generally reduced under rainfed conditions. The genotype-wise harvest index ranged from 30.87 to 38.82% under rainfed conditions and 38.75 to 50.82% under irrigation. RFU 318 recorded the highest reported harvest index (50.82%), whereas the source reported the lowest value for RFU 316. The reduction in harvest index under drought suggests lower partitioning of assimilates towards grain production under water-limited conditions. Similar findings were reported by Kumar *et al.* (2015)<sup>[3]</sup>.

**Table 1:** Effect of moisture regimes on plant height, number of tillers  $\text{hill}^{-1}$  and leaf area index of rice genotypes.

| Rice genotype | Plant height (cm) 60 DAT |         | Number of tillers/hill |         | Leaf area index (LAI) at tillering stage |         |
|---------------|--------------------------|---------|------------------------|---------|------------------------------------------|---------|
|               | Irrigated                | Rainfed | Irrigated              | Rainfed | Irrigated                                | Rainfed |
| RFU 301       | 100.00                   | 92.67   | 32.00                  | 24.00   | 3.30                                     | 1.8     |
| RFU 302       | 99.00                    | 89.00   | 31.00                  | 23.00   | 3.20                                     | 1.7     |
| RFU 303       | 101.00                   | 91.00   | 32.00                  | 24.00   | 2.70                                     | 1.2     |
| RFU 304       | 113.00                   | 103.00  | 38.00                  | 30.00   | 3.52                                     | 2.0     |
| RFU 305       | 95.00                    | 81.00   | 33.00                  | 25.00   | 2.70                                     | 1.2     |
| RFU 306       | 103.00                   | 96.33   | 31.00                  | 23.00   | 2.80                                     | 1.3     |
| RFU 307       | 104.00                   | 94.00   | 28.00                  | 20.00   | 3.10                                     | 1.6     |
| RFU 308       | 107.00                   | 96.00   | 32.00                  | 24.67   | 3.00                                     | 1.5     |
| RFU 309       | 107.00                   | 96.33   | 31.00                  | 23.67   | 2.70                                     | 1.2     |
| RFU 310       | 106.00                   | 92.67   | 29.00                  | 21.60   | 3.00                                     | 1.4     |
| RFU 311       | 107.00                   | 97.00   | 33.00                  | 25.00   | 2.90                                     | 1.3     |
| RFU 312       | 108.00                   | 94.67   | 32.00                  | 24.54   | 3.30                                     | 1.7     |
| RFU 313       | 110.00                   | 100.00  | 32.00                  | 24.41   | 3.40                                     | 1.8     |
| RFU 314       | 116.00                   | 106.00  | 28.00                  | 22.52   | 3.20                                     | 1.6     |
| RFU 315       | 106.00                   | 96.00   | 29.00                  | 22.31   | 3.20                                     | 1.6     |
| RFU 316       | 116.00                   | 102.67  | 31.00                  | 24.41   | 2.20                                     | 1.0     |
| RFU 317       | 109.00                   | 99.00   | 28.00                  | 21.00   | 2.70                                     | 1.1     |
| RFU 318       | 109.00                   | 99.00   | 29.00                  | 22.00   | 2.40                                     | 1.4     |
| RFU 319       | 110.00                   | 100.00  | 33.00                  | 26.21   | 2.80                                     | 1.8     |
| RFU 320       | 117.00                   | 106.33  | 32.00                  | 24.33   | 2.30                                     | 1.3     |
| RFU 321       | 101.00                   | 94.33   | 34.00                  | 27.00   | 2.40                                     | 1.4     |
| RFU 322       | 100.00                   | 90.00   | 33.00                  | 26.67   | 2.40                                     | 1.4     |
| RFU 323       | 104.00                   | 97.33   | 30.00                  | 23.41   | 2.10                                     | 1.1     |
| RFU 324       | 108.00                   | 98.00   | 32.00                  | 25.67   | 2.70                                     | 1.7     |
| RFU 325       | 107.00                   | 94.00   | 30.00                  | 23.00   | 2.80                                     | 1.8     |
| RFU 326       | 114.00                   | 104.00  | 32.00                  | 25.00   | 2.60                                     | 1.6     |
| RFU 327       | 117.00                   | 111.00  | 33.00                  | 26.43   | 3.65                                     | 2.6     |
| RFU 328       | 107.00                   | 97.00   | 31.00                  | 24.67   | 2.00                                     | 1.0     |
| RFU 329       | 120.00                   | 110.00  | 35.00                  | 27.00   | 3.80                                     | 2.8     |
| Poornima (LC) | 98.00                    | 91.00   | 33.67                  | 26.67   | 4.00                                     | 3.0     |
| Mean          | 107.63                   | 97.46   | 31.59                  | 24.55   | 2.9                                      | 1.6     |
| CD            | 4.70                     | 5.75    | 3.42                   | 4.00    | 0.10                                     | 0.30    |
| SEm±          | 1.65                     | 2.02    | 1.27                   | 1.40    | 0.03                                     | 0.10    |

**Table 2:** Effect of moisture regimes on crop growth rate, relative water content and total dry matter of rice genotypes.

| Rice genotype | Crop growth rate (g/m <sup>2</sup> /day) |         | Relative water content (%) |         | Total dry matter (g/m <sup>2</sup> ) |         |
|---------------|------------------------------------------|---------|----------------------------|---------|--------------------------------------|---------|
|               | Irrigated                                | Rainfed | Irrigated                  | Rainfed | Irrigated                            | Rainfed |
| RFU 301       | 12.00                                    | 8.00    | 52.01                      | 34.33   | 726.12                               | 630.09  |
| RFU 302       | 12.00                                    | 8.00    | 54.33                      | 36.01   | 737.00                               | 641.22  |
| RFU 303       | 14.00                                    | 10.00   | 46.25                      | 28.12   | 757.21                               | 661.65  |
| RFU 304       | 16.60                                    | 12.00   | 56.22                      | 38.45   | 852.29                               | 756.48  |
| RFU 305       | 11.00                                    | 7.00    | 50.56                      | 32.33   | 747.00                               | 651.77  |
| RFU 306       | 12.00                                    | 8.00    | 41.65                      | 23.00   | 759.31                               | 663.98  |
| RFU 307       | 15.00                                    | 11.00   | 54.87                      | 36.56   | 730.27                               | 634.00  |
| RFU 308       | 10.00                                    | 6.00    | 45.33                      | 27.37   | 765.15                               | 669.55  |
| RFU 309       | 9.00                                     | 5.05    | 44.87                      | 26.78   | 795.22                               | 699.30  |
| RFU 310       | 11.00                                    | 7.00    | 42.56                      | 24.00   | 754.13                               | 658.33  |
| RFU 311       | 14.00                                    | 10.00   | 50.88                      | 32.33   | 795.30                               | 699.17  |
| RFU 312       | 12.00                                    | 8.00    | 44.00                      | 26.12   | 790.38                               | 694.18  |
| RFU 313       | 11.00                                    | 8.00    | 49.54                      | 33.02   | 762.36                               | 666.33  |
| RFU 314       | 10.00                                    | 7.10    | 45.22                      | 29.63   | 774.18                               | 669.01  |
| RFU 315       | 8.41                                     | 5.12    | 43.57                      | 27.36   | 791.00                               | 686.09  |
| RFU 316       | 8.52                                     | 5.23    | 34.45                      | 18.54   | 827.40                               | 722.06  |
| RFU 317       | 9.42                                     | 6.00    | 33.22                      | 17.12   | 820.14                               | 715.02  |
| RFU 318       | 7.00                                     | 4.07    | 38.33                      | 22.56   | 830.00                               | 725.47  |
| RFU 319       | 12.61                                    | 9.07    | 41.44                      | 25.00   | 751.13                               | 646.05  |
| RFU 320       | 11.47                                    | 8.07    | 40.37                      | 24.16   | 762.43                               | 657.67  |
| RFU 321       | 13.53                                    | 10.07   | 49.00                      | 33.66   | 827.56                               | 722.35  |
| RFU 322       | 12.43                                    | 9.07    | 45.23                      | 29.39   | 811.00                               | 706.01  |
| RFU 323       | 10.91                                    | 7.07    | 44.45                      | 28.17   | 807.63                               | 702.03  |
| RFU 324       | 11.67                                    | 7.70    | 52.17                      | 36.23   | 836.22                               | 728.15  |
| RFU 325       | 12.67                                    | 8.70    | 51.19                      | 35.40   | 786.19                               | 678.18  |
| RFU 326       | 14.00                                    | 10.70   | 45.33                      | 29.12   | 754.04                               | 646.33  |
| RFU 327       | 19.00                                    | 15.70   | 58.57                      | 42.22   | 870.31                               | 762.02  |
| RFU 328       | 15.00                                    | 11.50   | 43.47                      | 27.64   | 766.23                               | 658.17  |
| RFU 329       | 20.31                                    | 16.40   | 59.78                      | 43.00   | 910.66                               | 802.37  |
| Poornima (LC) | 23.67                                    | 19.30   | 63.36                      | 45.54   | 921.84                               | 849.54  |
| Mean          | 13.1                                     | 9.05    | 47.76                      | 30.54   | 794.08                               | 693.27  |
| CD            | 0.51                                     | 0.94    | 1.03                       | 4.50    | 18.50                                | 20.63   |
| SEm±          | 0.16                                     | 0.34    | 0.36                       | 1.60    | 6.50                                 | 7.27    |

**Table 3:** Effect of moisture regimes on panicles m<sup>-2</sup>, grains panicle<sup>-1</sup> and grains m<sup>-2</sup> of rice genotypes

| Rice genotype | No. of panicle/m <sup>2</sup> |         | No. of grain /panicle |         | No. of grain/m <sup>2</sup> |         |
|---------------|-------------------------------|---------|-----------------------|---------|-----------------------------|---------|
|               | Irrigated                     | Rainfed | Irrigated             | Rainfed | Irrigated                   | Rainfed |
| RFU 301       | 424.03                        | 384.06  | 149.67                | 117.67  | 63459                       | 44923   |
| RFU 302       | 439.11                        | 399.21  | 164.33                | 132.33  | 72142                       | 52697   |
| RFU 303       | 418.23                        | 378.11  | 152.67                | 120.67  | 63815                       | 45529   |
| RFU 304       | 487.33                        | 457.67  | 185.33                | 153.33  | 87168                       | 66094   |
| RFU 305       | 443.12                        | 403.14  | 157.67                | 125.67  | 69846                       | 50564   |
| RFU 306       | 354.01                        | 314.16  | 192.67                | 160.67  | 68140                       | 50338   |
| RFU 307       | 353.12                        | 313.08  | 211.33                | 179.33  | 74530                       | 55930   |
| RFU 308       | 348.13                        | 308.22  | 147.00                | 115.00  | 51156                       | 35394   |
| RFU 309       | 404.00                        | 364.12  | 157.67                | 125.67  | 63645                       | 45647   |
| RFU 310       | 411.11                        | 372.15  | 142.67                | 110.67  | 58684                       | 40895   |
| RFU 311       | 460.17                        | 420.16  | 139.33                | 107.33  | 64093                       | 44990   |
| RFU 312       | 443.13                        | 403.01  | 168.33                | 136.33  | 74572                       | 54797   |
| RFU 313       | 378.66                        | 339.00  | 135.67                | 114.33  | 51327                       | 38774   |
| RFU 314       | 390.15                        | 349.03  | 144.67                | 123.33  | 56468                       | 42949   |
| RFU 315       | 440.46                        | 398.67  | 140.00                | 118.67  | 61600                       | 47394   |
| RFU 316       | 363.22                        | 322.00  | 120.33                | 95.00   | 43721                       | 31886   |
| RFU 317       | 332.11                        | 290.33  | 161.33                | 140.00  | 53509                       | 40700   |
| RFU 318       | 303.15                        | 262.00  | 175.33                | 154.00  | 53184                       | 40399   |
| RFU 319       | 357.11                        | 315.31  | 187.67                | 166.33  | 66934                       | 52326   |
| RFU 320       | 327.09                        | 286.00  | 143.00                | 121.67  | 46809                       | 34834   |
| RFU 321       | 409.12                        | 367.33  | 122.67                | 101.33  | 50130                       | 37284   |
| RFU 322       | 411.06                        | 369.67  | 158.00                | 136.67  | 64938                       | 50499   |
| RFU 323       | 387.12                        | 345.33  | 112.67                | 91.33   | 43564                       | 31631   |
| RFU 324       | 435.23                        | 405.67  | 122.00                | 97.67   | 53070                       | 39630   |
| RFU 325       | 398.15                        | 368.33  | 137.00                | 112.67  | 54480                       | 41382   |

|               |        |        |        |        |           |           |
|---------------|--------|--------|--------|--------|-----------|-----------|
| RFU 326       | 435.25 | 405.33 | 122.00 | 97.67  | 53029     | 39493     |
| RFU 327       | 444.11 | 415.00 | 188.33 | 164.00 | 83683     | 67957     |
| RFU 328       | 395.33 | 366.00 | 177.33 | 153.00 | 70106     | 56818     |
| RFU 329       | 470.11 | 431.23 | 193.33 | 169.00 | 94153     | 77567     |
| Poornima (LC) | 510.03 | 480.33 | 203.00 | 178.67 | 103462    | 85796     |
| Mean          | 405.77 | 367.79 | 157.1  | 130.8  | 63847.3   | 48171     |
| CD            | 64.21  | 69.25  | 15.62  | 16.25  | 11,465.21 | 10,267.14 |
| S.Em±         | 22.35  | 24.15  | 5.34   | 5.24   | 4040.86   | 5617.24   |

**Table 4:** Effect of moisture regimes on test weight, grain yield and harvest index of rice genotypes

| Rice genotype | Test weight (1000 seeds) |         | Grain yield (q/ha) |         | Harvest Index |         |
|---------------|--------------------------|---------|--------------------|---------|---------------|---------|
|               | Irrigated                | Rainfed | Irrigated          | Rainfed | Irrigated     | Rainfed |
| RFU 301       | 22.65                    | 18.98   | 30.47              | 26.01   | 47.49         | 35.49   |
| RFU 302       | 27.87                    | 24.02   | 34.03              | 30.04   | 47.66         | 35.66   |
| RFU 303       | 24.67                    | 20.05   | 29.34              | 24.18   | 48.42         | 36.42   |
| RFU 304       | 27.48                    | 23.70   | 41.07              | 32.26   | 41.61         | 34.61   |
| RFU 305       | 25.63                    | 21.80   | 35.17              | 31.01   | 48.32         | 36.32   |
| RFU 306       | 26.08                    | 22.09   | 33.22              | 29.05   | 47.03         | 35.03   |
| RFU 307       | 24.33                    | 20.50   | 31.06              | 27.22   | 44.95         | 32.95   |
| RFU 308       | 21.42                    | 17.61   | 32.02              | 28.15   | 48.53         | 36.53   |
| RFU 309       | 28.43                    | 24.60   | 40.15              | 31.02   | 41.41         | 35.41   |
| RFU 310       | 27.70                    | 23.95   | 33.13              | 29.33   | 47.73         | 35.73   |
| RFU 311       | 29.56                    | 25.76   | 35.66              | 31.45   | 46.90         | 34.90   |
| RFU 312       | 27.51                    | 23.71   | 28.15              | 24.67   | 45.18         | 33.18   |
| RFU 313       | 25.87                    | 22.04   | 32.33              | 28.22   | 49.57         | 37.57   |
| RFU 314       | 25.14                    | 18.51   | 33.01              | 29.01   | 45.10         | 33.10   |
| RFU 315       | 19.12                    | 12.50   | 31.40              | 27.07   | 49.17         | 37.17   |
| RFU 316       | 26.44                    | 19.81   | 38.04              | 29.36   | 38.75         | 30.87   |
| RFU 317       | 27.24                    | 20.62   | 34.34              | 28.44   | 41.87         | 31.75   |
| RFU 318       | 28.00                    | 21.38   | 29.76              | 22.66   | 50.82         | 38.82   |
| RFU 319       | 17.29                    | 10.64   | 31.18              | 25.12   | 49.84         | 37.84   |
| RFU 320       | 23.81                    | 17.10   | 40.02              | 32.15   | 44.46         | 36.46   |
| RFU 321       | 24.39                    | 17.71   | 33.11              | 27.03   | 48.84         | 36.84   |
| RFU 322       | 25.79                    | 19.12   | 34.59              | 28.05   | 47.99         | 35.99   |
| RFU 323       | 28.59                    | 21.95   | 29.38              | 21.26   | 48.78         | 36.78   |
| RFU 324       | 28.12                    | 22.71   | 30.45              | 22.34   | 48.37         | 36.37   |
| RFU 325       | 25.76                    | 20.43   | 27.01              | 22.10   | 49.51         | 37.51   |
| RFU 326       | 19.66                    | 14.30   | 32.23              | 27.01   | 49.81         | 37.81   |
| RFU 327       | 28.33                    | 22.90   | 42.11              | 33.06   | 46.11         | 34.11   |
| RFU 328       | 30.00                    | 24.61   | 34.02              | 29.33   | 49.79         | 37.79   |
| RFU 329       | 30.85                    | 25.42   | 44.01              | 35.23   | 48.78         | 36.78   |
| Poornima (LC) | 32.71                    | 27.31   | 51.34              | 40.21   | 48.14         | 36.14   |
| Mean          | 26.01                    | 20.86   | 34.39              | 28.40   | 47.03         | 35.73   |
| CD            | 0.55                     | 1.84    | 1.23               | 2.33    | 4.06          | 0.07    |
| S.Em±         | 0.19                     | 0.64    | 0.43               | 0.88    | 1.43          | 0.03    |

#### 4. Conclusion

The study demonstrated that moisture availability had a marked influence on the growth, physiological status and yield performance of rice genotypes. Rainfed conditions reduced plant height, tiller production, leaf area index, crop growth rate, relative water content and total dry matter compared with irrigated conditions. Similarly, yield attributes and grain yield were adversely affected under water-limited conditions.

Among the evaluated genotypes, Poornima (LC) and RFU 329 showed comparatively better performance under rainfed conditions, particularly for grain yield and several associated morpho-physiological traits. These genotypes may therefore have potential for cultivation or further evaluation under moisture-limited environments. However, multi-location and multi-season evaluation would be necessary before making a broader recommendation.

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