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# Assessment of Growth and Yield Performance of Twelve Different Rice Varieties Under North Konkan Coastal Zone of Maharashtra

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***Abstract***— *The present investigation entitled "Assessment of growth and yield performance of twelve different rice varieties under north Konkan coastal zone of Maharashtra" was carried out during the kharif season of the year 2021 and 2022 on the field of ASPEE, Agricultural Research and Development Foundation, Tansa Farm, At Nare, Taluka Wada, District Palghar, Maharashtra, India. The experiment was laid out in Randomized Block Design (RBD). The twelve varieties namely Zini, Jaya, Dandi, Rahghudya, Govindbhog, Dangi, Gurjari, VNR-7, VNR-8, VNR-9, Karjat-3, and Karjat-5 were replicated thrice. The plant height (cm), number of tillers per plant, number of panicles per plant, number of panicles (m²), and length of panicle (cm) were noted to the maximum with cv. "VNR-7". The highest number of seeds per panicle, test weight (gm), grain yield (q/ha), and straw yield (q/ha) were recorded with the cv. "VNR-7". While the lowest number of days to 50% flowering was also recorded with cv. "VNR-7" during the year 2021 and 2022.*

***Keywords***— ***Rice Varieties, Growth Assessment, Yield Performance, Randomized Block Design, Agricultural Research***

## I. INTRODUCTION

Rice is deeply engraved in the rich tradition and culture of India. It is the most important human food crop in the world. In addition to this It is also known as backbone of livelihood for millions of rural households and plays vital role in the country's food security. It is critical to global food security and to the welfare of around 800 million impoverished people around the world. The total area under rice cultivation in India is 2.75 million hectares, with an annual production of 105.2 million tonnes and a productivity of 2362 kg $ha^{-1}$. The area under rice cultivation in Maharashtra, India is 1.56 million ha, with an annual production of about 3.06 million tonnes and a productivity of 1963 kg $ha^{-1}$. The country has managed to maintain the balance between rice supply and demand by applying improved production techniques, including the use of high-yielding varieties/hybrids, expanding irrigation capacities and the use of various fertilizers.

India produces several rice varieties, including Basmati and non-Basmati rice. Basmati rice, known for its aromatic and long grains, is highly sought after in international markets and is primarily grown in northern states like Punjab and Haryana.

Rice is a staple food for the majority of the Indian population. It is consumed in various forms, such as boiled rice, rice flour, and rice-based dishes like biryani and pulao. Rice consumption varies by region, with southern India consuming more rice compared to the northern states, where wheat is the staple cereal.

Rice cultivation in India faces challenges such as water scarcity, pest and disease management, and climate change impacts. Sustainable rice farming practices, including the adoption of modern technology and

improved varieties are being promoted to address these challenges.

As the population continues to increase, the demand for rice is expected to increase further in the future (Abdullah *et al.*, 2008). Therefore, rice production must also increase. As the area under rice cultivation continues to decrease, there is a need to further improve rice productivity. To begin with limitation for the productivity of country's rice system the major limitations are inefficient use of fertilizers, the scarcity of water and labor, climatic change, inflation and rising socio-economics. In addition to this impact occurs on the labor migration, urbanization, youth, barren land, and concerns about environmental pollution and climate change due to weather conditions. For overcoming from this alarming situation rice production should meet the needs of a growing population is to increase rice productivity per unit area through more efficient use of resources. To improve rice productivity in India, high-yielding varieties capable of tolerating abiotic and abiotic stress should be explored for climate change. Rice crop production technologies that increase factor productivity, reduce farming costs, increase profits, and efficient use of inputs should be explored.

Jaya is a popular medium-duration variety with good disease resistance. It has good yield potential and can perform well in the Konkan region. Keep in mind that the availability and popularity of rice varieties can vary by region and over time, so it's essential to stay informed about the latest developments in rice cultivation and varieties in your specific area.

The present study was carried out to the evaluation of growth performance of twelve varieties on large scale under the North Konkan coastal zone of Maharashtra.

## II. MATERIALS AND METHODS

The experiment was conducted at ASPEE, Agricultural Research and Development Foundation Farm, Village Nare, Taluka Wada, District, Palghar, Maharashtra, India in the *kharif* season during 2021 and 2022 as well as laid on Randomized Block Design (RBD) with three replications (Panse and Sukhatme, 1967). The average annual rainfall of the study area is 2600-3000 mm. The average maximum and minimum temperatures are 23.8˚C and 12.6˚C, respectively. The gross plot size and net plot size were 3.30 m x 2.85 m, and 3.15 x 2.80 m, respectively. The twelve varieties namely $T_1$ - Zini, $T_2$ - Jaya, $T_3$ - Dandi, $T_4$ - Rahghudya, $T_5$ - Govindbhog, $T_6$ - Dangi, $T_7$ - Gurjari, $T_8$- VNR-7, $T_9$ - VNR-8, $T_{10}$ - VNR-9, $T_{11}$ - Karjat-3, and $T_{12}$ - Karjat-5 were replicated thrice and tested for different growth and yield parameters. The recommended dose of fertilizer (120 kg N: 50 kg $P_2O_5$: 50 kg $K_2O$: 6 kg Zn) was applied. The recommended dose of NPK was applied in the form of urea (46-0-0), single super phosphate (0-16-0), and the muriate of potash (0-0-60). Every variety was transplanted at the spacing of 20 X 15 cm. Recommended management practices and plant protection measures were taken. Observations on plant height (cm), number of productive tillers/plant at harvest (Nos.), no. of days to 50% flowering, grain test weight (1000 grains) (gm), panicle length (cm), number of grains/panicle, grain yield (q/ha) and husk weight (q/ha) were recorded.

The recommended dose of fertilizer (120 kg N: 50 kg $P_2O_5$: 50 kg $K_2O$: 6 kg Zn) was applied. The recommended dose of NPK was applied in the form of urea (46-0-0), single super phosphate (0-16-0), and the muriate of potash (0-0-60). Recommended management practices and plant protection measures were taken.

The data obtained during the study were subjected to statistical analysis using the WASP (Software developed by ICAR Research complex Goa).

## III. RESULT AND DISCUSSION

*Table 1a. Evaluation of Growth Performance of Twelve Different Rice Varieties*

| Treatment | Plant population (per square meter) | | Plant height (cm) | | No. of tillers per plant | | No. of days to 50% flowering | | No. of panicles per plant | | No. of panicles per square meter | | Length of panicle (cm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 |
| $T_1$ | 31.5 | 31 | 99.4 | 98.8 | 9.2 | 7.5 | 74.8 | 92.5 | 9.1 | 10.6 | 300.3 | 313.6 | 22.2 | 22.5 |
| $T_2$ | 31.5 | 31.5 | 100.4 | 101.3 | 9.4 | 9.5 | 72.5 | 88.5 | 9.2 | 10.7 | 276 | 288.3 | 23 | 23.3 |
| $T_3$ | 32 | 32 | 101.3 | 103.2 | 10.2 | 9.7 | 72 | 88 | 9.4 | 10.9 | 291.4 | 304.8 | 23.3 | 23.7 |
| $T_4$ | 32 | 32 | 101.5 | 103.8 | 10.8 | 10.7 | 76.5 | 84 | 9.9 | 11.4 | 336.6 | 352.3 | 23.7 | 24.1 |
| $T_5$ | 32.5 | 32.5 | 101.7 | 105.5 | 11.2 | 11.1 | 72.5 | 81.5 | 10.3 | 11.8 | 339.9 | 356.1 | 24.2 | 24.6 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **T 6** | 33 | 33 | 103.1 | 106.9 | 11.5 | 11.4 | 73.3 | 79.5 | 10.9 | 12.5 | 370.6 | 388.2 | 24.5 | 24.8 |
| **T 7** | 33 | 33 | 103.2 | 107 | 11.6 | 11.6 | 75.5 | 78.5 | 11.2 | 12.8 | 380.8 | 399.1 | 24.6 | 24.9 |
| **T 8** | 33.5 | 33 | 103.7 | 107.5 | 11.6 | 11.5 | 79 | 76.5 | 11.5 | 13.2 | 379.5 | 398 | 24.8 | 25.2 |
| **T 9** | 34 | 34 | 104.1 | 108.4 | 11.7 | 11.8 | 73.8 | 73.5 | 11.6 | 13.2 | 382.8 | 401.2 | 25 | 25.4 |
| **T 10** | 34 | 34 | 105.2 | 109.4 | 12.3 | 12.3 | 69.8 | 72 | 11.7 | 13.2 | 397.8 | 417.4 | 25.1 | 25.5 |
| **T 11** | 34 | 34 | 105.5 | 110.5 | 12.9 | 12.6 | 76.8 | 71 | 12.5 | 14.3 | 412.5 | 431.4 | 25.3 | 25.7 |
| **T 12** | 34.5 | 34 | 105.9 | 113.5 | 13.7 | 13 | 77 | 68 | 13 | 14.8 | 442 | 463.4 | 25.8 | 26.2 |
| S.Em(±) | 1.14 | 1.14 | 0.31 | 2.26 | 0.3 | 0.7 | 2.27 | 2.44 | 0.28 | 0.25 | 9.03 | 11.75 | 0.26 | 0.26 |
| CD | NS | NS | 0.98 | 7.02 | 0.94 | 2.19 | NS | 7.6 | 0.88 | 0.79 | 28.1 | 36.56 | 0.79 | 0.81 |

*Table 1b. Evaluation of yield Performance of Twelve Different Rice Varieties*

| **Treatment** | **No. of seeds per panicle** | | **Test weight (1000 grain wt.)** | | **Grain Yield (q/ha)** | | **Straw Yield (q/ha)** | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **2021** | **2022** | **2021** | **2022** | **2021** | **2022** | **2021** | **2022** |
| **T 1** | 117.8 | 120.9 | 17.7 | 18.5 | 39 | 40.9 | 57.9 | 62.3 |
| **T 2** | 122 | 125.3 | 19.4 | 20.1 | 47 | 49.2 | 69.6 | 74.9 |
| **T 3** | 123.1 | 126.3 | 20.4 | 21.2 | 48.6 | 51 | 72.1 | 77.6 |
| **T 4** | 124 | 127.2 | 23 | 23.9 | 52.9 | 55.4 | 78.4 | 84.4 |
| **T 5** | 125.2 | 128.6 | 25.7 | 26.8 | 56 | 56.6 | 83 | 89.4 |
| **T 6** | 131 | 134.9 | 29.1 | 30.4 | 57.7 | 56.7 | 85.5 | 92 |
| **T 7** | 141 | 145.6 | 29.7 | 31.1 | 57.3 | 57.2 | 84.8 | 91.3 |
| **T 8** | 145.7 | 150.4 | 32.1 | 33.5 | 58.2 | 58.4 | 86.3 | 91.8 |
| **T 9** | 158.4 | 164.1 | 32.3 | 33.7 | 58.9 | 58.8 | 87.3 | 92.2 |
| **T 10** | 171.1 | 177.1 | 32.5 | 33.9 | 63.8 | 59.5 | 94.5 | 93.1 |
| **T 11** | 184.7 | 191.3 | 33 | 34.4 | 64.9 | 60.3 | 96.3 | 95.2 |
| **T 12** | 203.5 | 209.4 | 34.1 | 35.6 | 68.6 | 61.2 | 101.7 | 97.1 |
| S.Em.± | 11.05 | 12.68 | 1.2 | 1.49 | 4.77 | 4.99 | 7.08 | 7.62 |
| CD | 34.39 | 39.48 | 3.72 | 4.63 | 14.86 | 15.54 | 22.02 | 23.72 |

The observations recorded at the successive stage of the plant development were analyzed statistically and were presented in Table 1a and Table 1b. The experimental findings of the present investigation and discussion had been done with reference by different authors as correlated with the different parameters. The growth period of the rice plant has divided into three stages; vegetative stage, reproductive stage, and ripening stage. The vegetative stage refers to the period from transplanting to panicle initiation, the reproductive stage from panicle initiation to heading, and the ripening stage from heading to maturity.

In 2021 the parameters are taken into account *viz.* Plant population, Plant height, No. of tillers per plant, No. of days for 50% flowering, No. of panicles per plant, No. of panicles per sq.m, Length of panicle, No. of seeds per panicle, Test weight, Grain yield and straw yield. In which the plant population per square meter was found non-significant among all treatments. Data on the plant height of rice (Table 1a) revealed that plant height increased progressively with an increase in the age of the crop. The plant height (121.7 cm) was found to be significantly higher at with $T_8$ - VNR 7, observations in the present

study are in confirmed with the findings reported by Dekhane *et al.*, 2019 and Dekhane *et al.*, 2022. While lowest plant height was recorded in the treatment $T_1$- Zini variety (92.1 cm). The number of tillers per plant was recorded highest in $T_8$- VNR 7 (14.4), which was statistically at par with $T_9$ (13.5). The lowest number of tillers per plant was recorded in the treatment $T_1$ - Zini variety (9.2). The number of productive tillers was increased with crop age up to 90 days. In Cv. "Gurjari" recorded higher numbers of productive tillers (14.5 / plant), similar observations on a number of productive tillers were found by Sarawgi and Sarawgi in Chhattisgarh (2004), Dekhane *et al*., 2019 and 2022 in Palghar. The number of seeds per panicle was recorded highest in $T_8$- VNR 7 (246.4), which was statistically at par with $T_9$- VNR 8 (223.8). The lowest number of panicles per plant was recorded in the treatment $T_1$ - Zini variety (121.6). The maximum test weight (1000 grain wt.) gm was recorded highest in $T_8$- VNR 7 (33.0 gm). The lowest maximum test weight (1000 grain wt.) gm was recorded in the treatment $T_1$ - Zini variety (15.5 gm). The maximum grain yield (q/ha) was recorded highest in $T_8$- VNR 7 (63.5 q/ha), which was statistically at par with $T_2$, $T_6$, $T_7$, $T_9$, $T_{10}$, $T_{11}$ and $T_{12}$. The lowest maximum grain yield (q/ha) was recorded in the treatment $T_1$ - Zini variety (46.9 q/ha). Dekhane *et al.*, 2019 and Dekhane *et al.*, 2022, also noted a similar trend at Palghar which was observed in the present study. The lowest number of days to 50% flowering was recorded in $T_1$- Zini (68 days) and $T_2$- Jaya (68 days) treatments. The maximum number of days to 50% flowering was recorded in the treatment $T_{12}$ - Karjat 5 variety (76 days) as compared to other treatments (Table 1a). The number of panicles per plant was recorded highest in $T_8$- VNR 7 (8.2), which was statistically at par with $T_9$- VNR 8 (7.7). The lowest number of panicles per plant was recorded in the treatment $T_1$ - Zini variety (5.4). The maximum length of the panicle was recorded highest in $T_8$- VNR 7 (28 cm). The lowest length of the panicle was recorded in the treatment $T_1$ - Zini variety (22 cm). The no. of panicles per square meter was found in the treatment $T_8$ -VNR (321.4) which was significantly superior over other treatments. The lowest number of panicles (166.3) per square was observed in $T_1$ Zini.

Also the same parameters were analyzed in the year of 2022. In which the non significant variation in plant population per square meter was found in all treatments. Data consisting in the table 1a, revealed that plant height increased progressively with an increase in the age of the crop. The plant height (129.5 cm) was found to be significantly higher at with $T_8$ - VNR 7 which was statistically at par with $T_9$ -VNR 8 (120.6 cm). Results found in the present study were confirmed with the findings reported by Dekhane *et al.*, 2019 and Dekhane *et al.*, 2022. While lowest plant height was recorded in the treatment $T_1$- Zini variety (100.2 cm). The number of tillers per plant was recorded significantly highest in $T_8$- VNR 7 (17.3). The lowest number of tillers per plant was found in the treatment $T_1$ - Zini variety (11.1).

The number of productive tillers increased with crop age up to 90 DAT in *cv*. "Gurjari" recorded higher numbers of productive tillers (14.5/plant), similar observations on a number of productive tillers were found by Sarawgi and Sarawgi in Chhattisgarh (2004) and Dekhane *et al*., 2019 and 2022 in Palghar.

The number of seeds per panicle was recorded highest in $T_8$- VNR 7 (254.7), which was statistically at par with $T_9$- VNR 8 (231.3). The lowest number of panicles per plant was recorded in the treatment $T_1$ - Zini variety (125). The maximum test weight (1000 grain wt.) gm was recorded highest in $T_8$- VNR 7 (35.3 gm). The lowest maximum test weight (1000 grain wt.) gm was recorded in the treatment $T_4$ - Rahghudya variety (16.3 gm). The maximum grain yield (q/ha) (Table 1b) was recorded highest in $T_8$- VNR 7 (67.2 q/ha), which was statistically at par with $T_9$- VNR 8 (66.9). The lowest grain yield (q/ha) was recorded in the treatment $T_1$ - Zini variety (49.6 q/ha). Dekhane *et al.*, 2019 and Dekhane *et al.*, 2022 also noted a similar trend at Palghar which was observed in the present study. The lowest number of days to 50% flowering was recorded in $T_8$- VNR 7 (63.3 days) which was at par with $T_9$ -VNR 8 (64.7 days). The maximum number of days to 50% flowering was recorded in the treatment $T_1$ - Zini variety (78.3 days) as compared to other treatments (Table 1a). The number of panicles per plant was recorded highest in $T_8$- VNR 7 (8.8) which was significantly superior to rest of all treatments. The lowest number of panicles per plant was recorded in the treatment $T_1$ - Zini variety (4.9). The maximum length of the panicle was recorded highest in $T_8$- VNR 7 (28 cm), which was at par with $T_7$, $T_9$, $T_{10}$, $T_{11}$ and $T_{12}$. The lowest length of the panicle was recorded in the treatment $T_1$ - Zini variety (22 cm). The no. of panicle per square meter was found in the treatment $T_8$ -VNR (312.5) which was significantly superior over other treatments. The lowest number of panicles per square was observed in $T_1$ Zini (163.3).

## IV. CONCLUSION

It can be seen from the above data that the *cvs.* "VNR 7, Jaya, Gurjari, VNR 8, Karjat 3 and Karjat 5" were significantly superior in yield parameters than all other varieties during the year 2021. Nevertheless, the *cvs.* "VNR 7, Jaya, Gurjari, VNR 8, Karjat 3 and Karjat 5"

varieties were found promising in next year *i.e* 2022 for yield attributing characters.

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