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# Effect of different fertility levels on various varieties of scented rice

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**Abstract**
The field experiment was conducted during the Kharif season of 2011-12.at Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) India to find out the Performance of Scented Rice Varieties under Different Fertility Levels. The maximum plant height (120.23cm) was recorded in the Kalanamak-3131 as compared to other varieties namely Pusa basmati and improved Pusa basmati at 90 days after transplanting of crop which might be due to inherited varietal character and among fertility The higher combined application of nutrients, (90 + 45 + 45 Kg NPK + 60 Ton FYM ha$^{-1}$) levels showed significantly higher plant height as compared to other treatments. The maximum number of shoots (10.48) and Dry matter accumulation (15.96 g hill-1) were recorded in the variety-improved Pusabasmati which found significantly higher than other varieties. In a similar way yield attributing characters like No. of grains/ panicle (299.47) Weight of grains/ panicle (2.08) Harvest index (39.29%) and Grain yield (39.41q ha$^{-1}$) are significantly higher in improved Pusabasmati varieties and infertility level (90 + 45 + 45 Kg NPK + 60 ton FYM ha$^{-1}$) showed significantly higher result. Regarding the benefit-cost ratio (1.46) it is found highest with combination with improved Pusabasmati along with (90 + 45 + 45 Kg 60-ton 60 Ton FYM ha$^{-1}$) levels.

**Keywords:** Scented rice varieties, fertility, growth and yield

## Introduction

Scented rice varieties with high-yielding varieties have high market value due to high their quality and aroma. Scented rice occupies a prime position on account of at its extra-long, super fine, slender grains, pleasant and exquisite aroma, fine cooking quality, sweet taste, soft texture, length and breadth-wise elongation on cooking with softness of cooked rice [1, 4]. The demand of aromatic rice in recent years has increased to a great extent for both own consumption as well as for export. However, the total production of aromatic rice in the country is nearly 5 million tons from an area of 0.7 m ha representing 1.5 per cent of the total rice area with an average productivity of 0.85 t ha$^{-1}$ the Indian aromatic rice including Basmati which is considered as a nature s gift to sub-continent. Basmati word has been derived from two Sanskrit words (vas-aroma) and (may up–ingrained or present from the beginning). Among various volatile compounds found in rice, responsible for its aroma is 2-acetylene-1 pyrroline the most significant. Basmati is a globally reputed aromatic group of rice, having three distinct quality features, pleasant: Aroma, super-fine grain (> 6.5 mm long) space along with extreme kernel elongation and soft texture of cooked rice Increasing the production of high-quality aromatic rice by the farmers for domestic as well as export purposes is a major concern of future agriculture strategy. Nearly 50-70 per cent of the Basmati rice produced in India and Pakistan are exported which contributes 10% of world trade. Export of Basmati rice from India has grown steadily during the last decade and is likely to increase in future. Apart from the above, different parameters of aromatic rice such as quantity, method and time of fertilizer application play vital roles. The escalating cost, inadequate supply of chemical fertilizers along with deteriorating soil health have led to considering the combined use of biocompost and inorganic sources of N for achieving higher N use efficiency, Increased yield and sustaining soil fertility. Considerable improvement in grain quality of aromatic rice has been observed that under integrated use of organic and inorganic fertilization as compared to RDF (Recommended dose of fertilizers) applied with inorganic fertilizer. Demand for aromatic rice is recognized as high valued than normal rice in the world market [6]. However, the total production of aromatic rice in the country is nearly 5 million tons from an area of 0.7 m ha representing 1.5 per cent of the total rice area with an average productivity of 0.85 t ha-l the Indian aromatic rice including Increasing the production of high-quality aromatic rice by the farmers for domestic as well as export purposes is major concern of future agriculture strategy. The improvement of grain quality of aromatic rice has been observed under the integrated use of organic and inorganic fertilizers as compared to RDF (Recommended dose of fertilizers) applied with inorganic fertilizer. Keeping in view of the above idea the present investigation was focused on integrated nutrient management on scented rice.

## Materials and Methods

The field experiment was carried out at the Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayoudhya (U.P.) India. During the *Kharif* season of 2011-12. The experimental site falls under subtropical zone in Indo-Gangetic plains having alluvial calcareous soil and lies between 24.4°-26.56° North latitude and 82.12°-83.98° East longitude with an elevation of about 113 m from mean sea level. The experimental field was well leveled having good irrigation and drainage facilities. The source of irrigation was a tube well. The soil of the experimental field was sandy-clay loam textural class with (0.37%) organic carbon, pH 7.72, (190.55 Kg/ha) available nitrogen, (13.03 Kg/ha) phosphorus and (257.10 Kg/ha) available potassium before the transplanting of rice during 2011. The amount of total rainfall received in 2011 during the crop period of investigation was 931.7 mm. The experiment was conducted in a split-plot design with three replications and four treatments. There are 3 scented rice varieties namely Kalanamak-3131, Pusabasmati -1 and Improved Pusabasmati (main treatment) and 4 fertilizer levels (F1 -60+30+30 Kg NPK $ha^{-1}$, F2 -90+45+45 Kg NPK $ha^{-1}$, F3 -60+30+30 Kg NPK+6ton FYM $ha^{-1}$ and F4 -90+45+45 Kg NPK+6ton FYM $ha^{-1}$) as sub treatment. There were 12 treatments in combinations, each replicated thrice with Gross plot size 5 m x 4 m = $20m^2$ and Net plot size 4.10 m x 3.2 m = 13.12 m2. After making individual experimental unit, the amount of fertilizer were applied uniformly through the area, single super phosphate, murate of potash and zinc sulphate. One-third dose of nitrogen and total phosphorous, potash and zinc were applied as a basal application before puddling and incorporated in the top 15 cm of soil. The remaining dose of nitrogen was applied as a top dressing in two equal doses each at tillering and panicle initiation stages, respectively. Urea was applied at the rate of 260 Kg $ha^{-1}$, single super phosphate at 375 Kg $ha^{-1}$, and muriate of potash at 66.66 Kg $ha^{-1}$ and zinc sulphate at the rate of 25 Kg $ha^{-1}$. The rice crop was transplanted on 21st July 2011 with a spacing of 20x15 cm and harvested on 25 December 2011. Five uniform plants were selected randomly from each plot and were tagged for recording the quantitative and qualitative observations. The observations recorded during the course of the investigation at 30, 60, and 90 DAS intervals and at harvest stage of the crop. The leaf area of five plants was measured by an automatic leaf area meter at the 30th, 60th and 90th days after sowing of the crop. The leaf area index was calculated by the formula. Leaf area index = Leaf area/ground area Dry weight of the plant was recorded at different stages of crop growth. Plant samples were dried in sun and subsequently into the oven at 700C until constant weight were obtained and total dry matter accumulation of the whole plant was recorded. Nitrogen, phosphorus, potash and sculpture were estimated by using standard methods. The Nitrogen content was determined in grains as well as in straw by the modified Kjeldahl method as described by Jackson [3]. Total N content at grain and straw was multiplied by the respective dry matter yield to get the total N uptake by plants, Phosphorus content was determined in grains as well as in straw by van do molybdophosphoric yellow colour method followed by spectrophotometric determination as suggested by Jacksan [3]. Total phosphorus in grain and straw was estimated by multiplying phosphorus content with dry matter of plant to find out phosphorus removal $ha^{-1}$ and Potassium content was determined with the help of a flame photometer as described by Jackson [3]. Potassium was calculated by multiplying dry matter with Potassium content obtained from analysis of grain and straw to obtain Potassium content in grain and straw and Potassium removal $ha^{-1}$. The uptake of nutrient (Kg $ha^{-1}$) were calculated by using the following formula.

$$\text{Nutrient Uptake} = \frac{\text{Dry Matter Production of Crop x Nutrient Content in Dry Matter}}{100}$$

All the data obtained from rice and wheat for two consecutive years was pooled and subjected to analysis of variance [2].

## Results and Discussion

### Response of growth, yield attributing and yield character of scanted rice variety as influenced by different treatments

The maximum plant height (120.23cm) was recorded in the Kalanamak-3131 as compared to other varieties namely Pusa basmati and improved Pusa basmati at 90 days after transplanting of crop which might be due to inherited varietal character and among fertility. The higher combined application of nutrients, (90 + 45 + 45 Kg NPK + 60 ton FYM $ha^{-1}$) levels showed significantly higher plant height as compared to other treatments. Singh and Bhattacharya [9] found that the plant height and dry weight of paddy increased with levels of NPK application up to the highest level (160: 80: 80 NPK Kg $ha^{-1}$) at all stages of crop growth.

The maximum number of shoots (10.48) and Dry matter accumulation (15.96 g hill-1) were recorded in the variety-improved Pusabasmati which found significantly higher than other varieties. This might be due to the increased availability of nutrients which led to better root developments ultimately produced more number of shoots per hill and Dry matter accumulation at 90 days. The higher combined application of fertilizer (90 + 45 + 45 Kg NPK + 60-ton FYM $ha^{-1}$) showed significantly higher number of shoot hill-1 and Dry matter accumulation as compared to another level of fertility treatments at 90 days. The present findings in conformity to Tunga and Nayak [10] were reported that different doses of fertility in West Bengal comprising the highest rate of NPK fertilizer on different high-yielding rice and hybrid rice gave more yield and yield attributing character than the low rate of fertilizer. In a similar way yield attributing characters like No. of grains/ panicle (299.47) Weight of grains/panicle (2.08) Harvest index (39.29%) and Grain yield (39.41q $ha^{-1}$) are also significantly higher in improved Pusabasmati varieties and infertility level (90 + 45 + 45 Kg NPK + 60-ton FYM $ha^{-1}$) showed significantly higher result Kumar *et al.* [5] conducted a field experiments at New Delhi to determine the response of nutrient management practices on Basmati rice. The recorded highest grain yield was due to application of nutrients with ½ compost + ½ NPK. Variations in source of nutrients remained at par and failed to produce significant differences among themselves in respect to grain yield.

**Effect of Economics of the scanted rice variety as Influenced by different treatments**

Maximum cost of cultivation (Rs. 32094.36) and gross return (Rs. 766710) were recorded under improved Pusa basmati with F4 (90+45 + 45 Kg NPK +6 ton FYM $ha^{-1}$) followed by Pusabasmati-1 with same fertility level under improved Pusa basmati with of F4 (90+45 + 45 Kg NPK +6 ton FYM $ha^{-1}$). Maximum net return (Rs. 44626.45) and benefit-cost ratio (1.46) were recorded under improved Pusabasmati with F3 (60 + 30+30 Kg NPK +6 ton FYM $ha^{-1}$). Similar results shown by Singh and Singh [8] they reported that economic parameters *viz.*, gross income, cultivation cost and net return from rice were maximized at the highest doses of N180, P90 and K90 Kg $ha^{-1}$.

**Table 1:** Growth and yield attributing character of mustard as influenced by different treatments at 90 days

| Treatments | Plant height (cm) at 90 days | Number of Shoots per hill | Dry Matter Accumulation (g/hill) | Days taken to 50% Panicle Emergence |
|---|---|---|---|---|
| **Varieties** | | | | |
| V1-Kalanamak-3131 | 120.23 | 6.15 | 14.16 | 103.58 |
| V2-Pusabasmati-1 | 100.42 | 8.95 | 15.47 | 103.58 |
| V3-Improved Pusabasmati | 102.86 | 10.48 | 15.96 | 104.33 |
| S.E.M ± | 1.60 | 0.08 | 0.24 | 0.15 |
| CD at 5% | 6.28 | 0.31 | 0.94 | NS |
| **Fertility level** | | | | |
| F1-60+30+30 Kg NPK $ha^{-1}$ | 100.24 | 7.10 | 14.08 | 102.89 |
| F2-90+45+45 Kg NPK $ha^{-1}$ | 112.18 | 8.90 | 15.82 | 103.67 |
| F3-60+30+30 Kg NPK+6ton FYM $ha^{-1}$ | 103.13 | 7.57 | 14.68 | 104.11 |
| F4-90+45+45 Kg NPK+6ton FYM $ha^{-1}$ | 115.80 | 10.53 | 16.21 | 104.67 |
| S.E.M ± | 2.57 | 0.07 | 0.38 | 0.22 |
| CD at 5% | 7.64 | 0.21 | 1.13 | 0.64 |

**Table 2:** Yield and economics of mustard as influenced by different treatments

| Treatments | No. of grains/panicles | Weight of grains/panicle | Harvest index (%) | Grain yield (q $ha^{-1}$) |
|---|---|---|---|---|
| **Varieties** | | | | |
| V1-Kalanamak-3131 | 219.61 | 1.52 | 28.97 | 28.90 |
| V2-Pusabasmati-1 | 290.26 | 2.01 | 39.19 | 38.20 |
| V3-Improved Pusabasmati | 299.47 | 2.08 | 39.29 | 39.41 |
| S.E.M ± | 10.33 | 0.07 | 1.63 | 1.64 |
| CD at 5% | 40.54 | 0.28 | NS | 6.44 |
| **Fertility level** | | | | |
| F1-60+30+30 Kg NPK $ha^{-1}$ | 243.67 | 1.69 | 35.10 | 32.07 |
| F2-90+45+45 Kg NPK $ha^{-1}$ | 286.67 | 1.99 | 36.24 | 37.73 |
| F3-60+30+30 Kg NPK+6ton FYM $ha^{-1}$ | 254.93 | 1.77 | 35.55 | 33.55 |
| F4-90+45+45 Kg NPK+6ton FYM $ha^{-1}$ | 293.84 | 2.04 | 36.37 | 38.67 |
| S.E.M ± | 7.54 | 0.05 | 1.05 | 1.16 |
| CD at 5% | 22.40 | 0.16 | NS | 3.44 |

**Table 3:** Economics of the different treatment combinations

| Treatment | Grain yield (q $ha^{-1}$) | Gross return (Rs. $ha^{-1}$) | Cost of cultivation (Rs. $ha^{-1}$) | Net return (Rs. $ha^{-1}$) | B: C Ratio (%) |
|---|---|---|---|---|---|
| V1 F1 | 24.70 | 50668 | 28645.05 | 21482.95 | 0.74 |
| V1 F2 | 26.27 | 52859 | 30072.84 | 22796.16 | 0.75 |
| V1 F3 | 31.53 | 62041 | 30512.55 | 31528.45 | 1.03 |
| V1 F4 | 32.74 | 64624 | 32094.36 | 32529.64 | 1.01 |
| V2 F1 | 35.17 | 63911 | 28645.05 | 35265.95 | 1.23 |
| V2 F2 | 36.78 | 66582 | 30072.84 | 36509.16 | 1.21 |
| V2 F3 | 40.02 | 72340 | 30512.55 | 41827.45 | 1.37 |
| V2 F4 | 40.82 | 73796 | 32094.36 | 41701.64 | 1.29 |
| V3 F1 | 35.97 | 65239 | 28645.05 | 36593.95 | 1.27 |
| V3 F2 | 37.59 | 68053 | 30072.84 | 37980.16 | 1.26 |
| V3 F3 | 41.63 | 75139 | 30512.55 | 44626.45 | 1.46 |
| V3 F4 | 42.44 | 766710 | 32094.36 | 44515.64 | 1.38 |

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