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## Response of organic manure and age of seedling on growth and yield of Broccoli (*Brassica oleracea* var. *italica*) cv. Besty

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### Abstract

The experiment entitled "Response of Organic Manure and Age of Seedling on Growth and Yield of Broccoli (*Brassica oleracea* var. *italica*) cv. Besty" was conducted during Rabi season of the year 2021-2022 on Instructional farm of Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in Factorial Randomized Block Design comprising of 15 treatments viz., T<sub>1</sub>-FYM 0 q/ha + 25 DAS, T<sub>2</sub>-FYM 0 q/ha + 30 DAS, T<sub>3</sub>-FYM 0 q/ha + 35 DAS, T<sub>4</sub>-FYM 30 q/ha(9.45 q) + 25 DAS, T<sub>5</sub>-FYM 30 q/ha(9.45 q) + 30 DAS, T<sub>6</sub>-FYM 30 q/ha(9.45 q) + 35 DAS, T<sub>7</sub>-FYM 40 q/ha(12.60 q) + 25 DAS, T<sub>8</sub>-FYM 40 q/ha(12.60 q) + 30 DAS, T<sub>9</sub>-FYM 40 q/ha(12.60 q) + 35 DAS, T<sub>10</sub>-FYM 50 q/ha(15.75 q) + 25 DAS, T<sub>11</sub>-FYM 50 q/ha(15.75 q) + 30 DAS, T<sub>12</sub>-FYM 50 q/ha(15.75 q) + 35 DAS, T<sub>13</sub>-FYM 60 q/ha(18.90 q) + 25 DAS, T<sub>14</sub>-FYM 60 q/ha(18.90 q) + 30 DAS, T<sub>15</sub>-FYM 60 q/ha(18.90 q) + 35 DAS each replicated three times. Treatments were randomly arranged in each replication, divided into fifteen plots. Based upon this experiment it is concluded that application of higher level of FYM @ 60 q/ha with 35 days old seedling (F<sub>4</sub> P<sub>3</sub>) recorded the maximum plant height, highest number of leaves per plant, leaf area per plant, diameter of curd, weight of the curd, yield per plot and curd yield (tonne/ha) of Broccoli.

**Keywords:** Broccoli, FYM, seedling, curd yield

### Introduction

Broccoli is cultivated in a limited area in India. However, due to its rise in popularity, there is a growing trend of its cultivation by farmers as well as consumption by consumers in metropolitan cities. The word "broccoli" is an Italian word derived from the Latin 'brachcum', meaning an arm or branch. Broccoli is commonly known as Hari Gobi in Hindi. In recent times, consumers are demanding high quality, nutritious and safe foods, thus, broccoli is considered as a promising vegetable for the needs of consumers and preference for organic food. There is diversity in its colour varying from green, purple and yellow but green colour is quite popular in USA and grown on limited scale in England. The green sprouting type of broccoli is classified in accordance to their maturity i.e. early, medium and late cultivars. Broccoli with a kind of terminal head consisting of green buds and thick fleshy flower stalks morphologically resembles cauliflower except auxiliary heads, which develop in the axils of leaves and may contribute up to 50% of the total yield. Organic farming has proved time and again that it is not only resource conservation but productive as well. One such viable option involves FYM. These organic farming practices work in harmony with nature using various indigenously available resources, chief among them soil, fauna components that establish a synchrony in the nutrient cycle. The use of Farm Yard Manure (FYM) is known to maintain the productivity of the soil longer than inorganic fertilizers. Field manure contains all the macro-and micro-nutrients necessary for plant growth (Hesse, 1984)<sup>[9]</sup>, but its main effects are due to nitrogen, phosphorus and potassium. The maintenance of organic matter in the soil is important for improving the nutrient and structural status of the soil, especially under tropical conditions in India. In addition to its nutritional role, FYM controls the dynamics of all macro-and micronutrients. The activity of the soil organisms is very important for ensuring sufficient nutrient supply to the plant. If the microorganisms find suitable conditions for their growth they can be very efficient in dissolving nutrients and making them available to the plants. While crop yield was the primary focus in the past, increasing population growth and awareness of the limited ability to bring more land into production led to the notion of crop stability or sustainable intensification, i.e. consistently high yields without harming the productive capacity of the soil.

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## Materials and Methods

The experiment entitled “Response of Organic Manure and Age of Seedling on Growth and Yield of Broccoli (*Brassica oleracea* var. *italica*) cv. Besty” was conducted during Rabi season of the year 2021-2022 on Instructional farm of Department of Horticulture, AKS University, Satna (M.P.). The experiment was laid out in Factorial Randomized Block Design comprising of 15 treatments viz., T<sub>1</sub>-FYM 0 q/ha + 25 DAS, T<sub>2</sub>-FYM 0 q/ha + 30 DAS, T<sub>3</sub>-FYM 0 q/ha + 35 DAS, T<sub>4</sub>-FYM 30 q/ha(9.45 q) + 25 DAS, T<sub>5</sub>-FYM 30 q/ha(9.45 q) + 30 DAS, T<sub>6</sub>-FYM 30 q/ha(9.45 q) + 35 DAS, T<sub>7</sub>-FYM 40 q/ha(12.60 q) + 25 DAS, T<sub>8</sub>-FYM 40 q/ha(12.60 q) + 30 DAS, T<sub>9</sub>-FYM 40 q/ha(12.60 q) + 35 DAS, T<sub>10</sub>-FYM 50 q/ha(15.75 q) + 25 DAS, T<sub>11</sub>-FYM 50 q/ha(15.75 q) + 30 DAS, T<sub>12</sub>-FYM 50 q/ha(15.75 q) + 35 DAS, T<sub>13</sub>-FYM 60 q/ha(18.90 q) + 25 DAS, T<sub>14</sub>-FYM 60 q/ha(18.90 q) + 30 DAS, T<sub>15</sub>-FYM 60 q/ha(18.90 q) + 35 DAS each replicated three times. Treatments were randomly arranged in each replication, divided into fifteen plots. The seeds were sown on 27<sup>th</sup> October 2021, germination started and transplanted on 29<sup>th</sup> November 2021 the recording of observations was done 30 days after transplanting and subsequent readings were recorded after every 15 days interval. The crop was harvested on 11<sup>th</sup> February-2022. Raised nursery beds of 3.0 x 1.0 m were prepared thoroughly. Then the seeds were sown on 27<sup>th</sup> October 2021 during Rabi season. The nursery beds were maintained systematically upto 30 days till the seedlings were ready for transplanting. In order to maintain uniform crop stand in each plot, the dead seedlings were replaced by the new once up to 5 DAT. This gap filling continued till 10<sup>th</sup> days of transplanting. The first light irrigation is given soon after sowing to ensure proper germination and the subsequent irrigation were given at the interval of 10-20 days. Flood irrigation was given once in week during the entire period of crop growth. After top dressing of rest amount of fertilizer earthing up was done to promote proper development of roots and to provide proper soil aeration. Irrigation was done immediately after the operation.

## Results and Discussion

Data mentioned in table 1 clearly revealed that the optimum levels of FYM and 35 days old seedling were found to significantly improve growth and yield of the crop. The vegetative characters like plant height and number of leaves per plant at 26, 30 and 35 days old seedling were found to be significantly higher with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The diameter of stem (cm) 45 DAT was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve diameter of stem (cm). The maximum diameter of stem was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The Leaf area per plant (cm<sup>2</sup>) was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve Leaf area per plant (cm<sup>2</sup>). The maximum Leaf area per plant (cm<sup>2</sup>) was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The days required for 50 percent curd initiation was found to be significantly lower among the treatments. The optimum levels of FYM were found to significantly early for days required for 50 percent curd

initiation. The minimum days required for 50 percent curd initiation was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and higher was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The days required for 100 percent curd initiation was found to be significantly lower among the treatments. The optimum levels of FYM were found to significantly early for days required for 100 percent curd initiation. The minimum days required for 100 percent curd initiation was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and higher was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The days required for curd maturity was found to be significantly lower among the treatments. The optimum levels of FYM were found to significantly early for curd maturity. The minimum days required for curd maturity was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and higher was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The diameter of curd (cm) was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve diameter of curd (cm). The maximum diameter of curd (cm) was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The fresh weight per curd (g) was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve fresh weight per curd (g). The maximum fresh weight per curd (g) was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The dry weight per curd (g) was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve dry weight per curd (g). The maximum dry weight per curd (g) was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). FYM level encourages the formation of new cells, promote plant vigour and hasten leaf development which helps in harvesting more solar energy, better utilization of nitrogen which contribute towards the plant height and ultimately increased the nutrient and water holding capacity of soil as reported by Padamwar and Dakore (2010) [2], Srichandan *et al.* (2015) [6], Singh *et al.* (2020) [5] and Lal *et al.* (2021) [1] in Broccoli.

The yield per plot (kg/plot) was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve yield per plot (kg/plot). The maximum yield per plot (kg/plot) was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). The yield (tonne/ha) was found to be significantly higher among the treatments. The optimum levels of FYM were found to significantly improve yield (tonne/ha). The maximum yield (tonne/ha) was recorded with FYM 60 q/ha and 35 days old seedling (F4 P<sub>3</sub>) and lower was recorded without FYM and 25 days old seedling (F0 P<sub>1</sub>). These results are substantiated with Subrahmaniyan *et al.* (2011) [7], Thapa *et al.* (2013) [8], Shree *et al.* (2014) [4] and Patyal and Chamroy (2021) [3] in Broccoli.

Based upon this experiment it is concluded that application of higher level of FYM @ 60 q/ha with 35 days old seedling (F4 P<sub>3</sub>) recorded the maximum plant height, highest number of leaves per plant, leaf area per plant, diameter of curd, weight of the curd, yield per plot and curd yield (tonne/ha) of Broccoli.

**Table 1:** E Effect of Organic Manure and Age of Seedling on Growth of Broccoli cv. Besty

| Treatments             | Plant height (cm) |                |                |          | Number of leaves per plant |                |                |          | Diameter of stem (cm) |                |                |          | Leaf area per plant (cm <sup>2</sup> ) |                |                |          |
|------------------------|-------------------|----------------|----------------|----------|----------------------------|----------------|----------------|----------|-----------------------|----------------|----------------|----------|--|----------------|----------------|----------|
|                        | P <sub>1</sub>    | P <sub>2</sub> | P <sub>3</sub> | Mean     | P <sub>1</sub>             | P <sub>2</sub> | P <sub>3</sub> | Mean     | P <sub>1</sub>        | P <sub>2</sub> | P <sub>3</sub> | Mean     | P <sub>1</sub>                         | P <sub>2</sub> | P <sub>3</sub> | Mean     |
|                        | F0                | 36.80          | 38.68          | 40.51    | 38.66                      | 19.61          | 19.87          | 20.15    | 19.88                 | 2.05           | 2.17           | 2.30     | 2.17                                   | 1203.47        | 1358.92        | 1484.66  |
| F1                     | 38.93             | 39.55          | 41.38          | 39.95    | 22.47                      | 22.66          | 23.08          | 22.74    | 2.97                  | 3.21           | 3.52           | 3.23     | 1453.70                                | 1524.09        | 1651.93        | 1543.24  |
| F2                     | 39.76             | 40.84          | 42.70          | 41.10    | 24.00                      | 24.81          | 25.31          | 24.71    | 3.22                  | 3.59           | 3.73           | 3.51     | 1691.18                                | 1701.99        | 1796.48        | 1729.88  |
| F3                     | 42.09             | 43.35          | 44.47          | 43.30    | 25.28                      | 26.75          | 27.33          | 26.45    | 3.46                  | 3.82           | 4.19           | 3.82     | 1678.31                                | 1715.27        | 1847.14        | 1746.91  |
| F4                     | 42.58             | 43.91          | 45.12          | 43.87    | 26.86                      | 27.65          | 29.46          | 27.99    | 4.40                  | 4.65           | 4.84           | 4.63     | 1826.48                                | 1864.33        | 1912.70        | 1867.84  |
| Mean                   | 40.03             | 41.27          | 42.84          |          | 23.64                      | 24.35          | 25.07          |          | 3.22                  | 3.49           | 3.72           |          | 1570.63                                | 1632.92        | 1738.58        |          |
| For comparing means of | S.Ed.(±)          |                |                | CD at 5% | S.Ed.(±)                   |                |                | CD at 5% | S.Ed.(±)              |                |                | CD at 5% | S.Ed.(±)                               |                |                | CD at 5% |
| F                      | 0.11              |                |                | 0.34     | 0.13                       |                |                | 0.40     | 0.03                  |                |                | 0.10     | 3.45                                   |                |                | 10.35    |
| P                      | 0.10              |                |                | 0.30     | 0.11                       |                |                | 0.33     | 0.02                  |                |                | 0.06     | 2.32                                   |                |                | 7.98     |
| FXP                    | 0.22              |                |                | 0.66     | 0.23                       |                |                | 0.70     | 0.05                  |                |                | 0.16     | 5.78                                   |                |                | 17.34    |

**Table 2:** E Effect of Organic Manure and Age of Seedling on Yield of Broccoli cv. Besty

| Treatments             | Diameter of curd (cm) |                |                |          | Fresh weight per curd (g) |                |                |          | Yield per plot (kg/plot) |                |                |          | Yield (tonne/ha) |                |                |          |
|------------------------|-----------------------|----------------|----------------|----------|---------------------------|----------------|----------------|----------|--------------------------|----------------|----------------|----------|------------------|----------------|----------------|----------|
|                        | P <sub>1</sub>        | P <sub>2</sub> | P <sub>3</sub> | Mean     | P <sub>1</sub>            | P <sub>2</sub> | P <sub>3</sub> | Mean     | P <sub>1</sub>           | P <sub>2</sub> | P <sub>3</sub> | Mean     | P <sub>1</sub>   | P <sub>2</sub> | P <sub>3</sub> | Mean     |
|                        | F0                    | 8.06           | 8.45           | 9.61     | 8.71                      | 304.82         | 357.15         | 384.61   | 257.53                   | 3.882          | 4.130          | 4.482    | 4.165            | 3.48           | 5.92           | 7.64     |
| F1                     | 9.76                  | 10.16          | 10.59          | 10.17    | 415.21                    | 422.23         | 438.05         | 425.16   | 5.688                    | 4.815          | 5.166          | 5.223    | 9.51             | 9.83           | 10.85          | 10.06    |
| F2                     | 11.13                 | 11.92          | 12.37          | 11.81    | 447.58                    | 454.25         | 461.34         | 454.39   | 5.256                    | 5.373          | 5.680          | 5.436    | 9.89             | 10.40          | 12.08          | 10.79    |
| F3                     | 12.09                 | 12.86          | 13.04          | 12.66    | 447.58                    | 474.06         | 489.78         | 470.47   | 5.451                    | 5.635          | 5.813          | 5.633    | 11.74            | 12.59          | 13.06          | 12.46    |
| F4                     | 13.07                 | 13.51          | 13.88          | 13.49    | 491.33                    | 493.84         | 498.06         | 494.41   | 5.877                    | 5.907          | 5.951          | 5.912    | 12.55            | 14.35          | 15.79          | 14.23    |
| Mean                   | 10.82                 | 11.38          | 11.90          |          | 366.50                    | 440.31         | 454.37         |          | 5.172                    | 5.231          | 5.418          |          | 9.43             | 10.62          | 11.88          |          |
| For comparing means of | S.Ed.(±)              |                |                | CD at 5% | S.Ed.(±)                  |                |                | CD at 5% | S.Ed.(±)                 |                |                | CD at 5% | S.Ed.(±)         |                |                | CD at 5% |
| F                      | 0.06                  |                |                | 0.18     | 0.08                      |                |                | 0.25     | 0.19                     |                |                | 0.57     | 0.21             |                |                | 0.42     |
| P                      | 0.02                  |                |                | 0.07     | 0.03                      |                |                | 0.10     | 0.15                     |                |                | 0.45     | 0.14             |                |                | 0.28     |
| FXP                    | 0.08                  |                |                | 0.25     | 0.11                      |                |                | 0.34     | 0.33                     |                |                | 0.99     | 0.35             |                |                | 0.71     |

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