**Influence of Methods of sowing and organic manures on Growth, Yield and Economics of wheat (*Triticum aestivum* L.)**


## Abstract

In the winter Rabi season of 2020-21, a meticulous field experiment transpired at the certified organic experiment farm of the SHUATS Model of Organic Farm (SMOF) in NAI, Prayagraj. The primary objective was to scrutinize the nuanced impact of diverse sowing methods and organic manures on the yield attributes of wheat (*Triticum aestivum* L.). This comprehensive investigation comprised nine distinct treatments, each replicated three times and arranged in a randomized block design.Noteworthy findings emerged, revealing that Line sowing coupled with Poultry manure (5 t/ha), Panchagavya 3% FS, and Jeevamrutha 500 l/ha FS resulted in the tallest plant height (78.30 cm). Moreover, the optimal combination of SWI with Poultry manure (5 t/ha), Panchagavya 3% FS, and Jeevamrutha 500 l/ha FS exhibited the highest number of tillers per plant (10.53) and the maximum dry weight per plant (18.00 g/plant).The pinnacle of success, however, was achieved by Line sowing in conjunction with Poultry manure (5 t/ha), Panchagavya 3% FS, and Jeevamrutha 500 l/ha FS, where it not only showcased the highest grain yield (3.16 t/ha) and straw yield (4.48 t/ha) but also demonstrated superiority in gross return (Rs. 1,44,000.00/ha), net returns (Rs. 95,940.00/ha), and an impressive benefit-cost ratio of 1.99. These outcomes underscore the paramount importance of precision in agricultural practices for achieving not only enhanced productivity but also economic viability.



**Keywords:** Organic, Manures, Sowing methods, Economics




## INTRODUCTION

Wheat stands second in grain production in the world and most widely cultivated food crop (Meena and Singh, 2013). India has now become the second largest grown crop and staple food in India after rice. Which ranks first both in acreage and production (758.3 million tonnes) among the grain crop of the world (FAO, 2019).After Green revolution, chemical fertilizers increased the crop production and productivity but suppling the nutrient source from inorganic fertilizer for long term without any addition of organic manures affected the soil health and resulted in the largescale deficiency of micro nutrients in the soil which play an important role in enhancing the quality and quantity of the agriculture

production.Future, heavy application of inorganic fertilizers left residues in grain fruits and vegetables and cause human and animal health. To overcome the problem of nutrient deficiency and helping the nature rather than destroying it. The prolonged and over-use of chemicals than crop requirement resulted in human health hazard and imbalance in natural resources (Mithilesh and Abraham, 2017). Use of organic manures have been found to be promising in arresting the decline in productivity through correction of deficiencies of secondary and micro-nutrients and its beneficial influence on the physical and biological properties of soil (Kumar and Tripathi, 2007). Planting techniques is of considerable importance among the agronomic practise, as appropriate adjustment of plants in the field, may not only ensure optimum plant population but also enable the plant to exploit the land and other input resources more efficiently. System of Wheat Intensification (SWI) is another method of sowing which is based on the principles of System of Rice Intensification (SRI) is a new wheat cultivation technique that needs to maintain the plant to plant distance at 22.5 cm to 22.5 cm between lines and high potentially to supply high wheat yield per drop of water and per kg of agriculture inputs and application of other (Dhar *et al*., 2016).The role of foliar application or seed soaking of panchagavya in production of many plantation crops has been well documented in India. These organic formulations contain all the trace elements and some essential plant growth regulators (e.g. Auxin, Gibberellin and cytokinin) present in liquid manure (Papen *et al.*, 2002) and (Swaminathan *et al*., 2007). To influence the methods of sowing and organic manures on growth and yield of wheat and to study the economics of different treatment combinations.

## MATERIAL AND METHODS

An experiment conducted during *Rabi* season of 2020-21 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P).The SMOF is located at 25 degree 39’42” N latitude, 81 degree 67’56” E longitude and 98 m altitude above the sea level, during *Rabi* season 2020 on sandy loam soil. SMOF was developed under the National Project on Organic Farming (NPOF) by Department of Agronomy, the two hectares area has been certified by Lacon Quality Certification (Pvt.) Ltd. Which was having nearly neutral in soil reaction (pH 7.0), organic carbon (0.375 %), available nitrogen (168.75 kg/ha), available phosphorus (17.4 kg/ha) and available potassium (231.7 kg/ha). The climate of the region is semi-arid subtropical. Treatment combination of $T_1$- Broadcasting + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_2$- Line sowing + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_3$- SWI + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_4$- Broadcasting + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_5$- Line sowing + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_6$- SWI + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_7$- Broadcasting + Vermicompost (4 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_8$- Line sowing + Vermicompost (4 t/ha) +

Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_9$- SWI + Vermicompost + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS. The nine treatments were Replicated thrice in Randomized Block Design. Data regarding growth parameters *viz*., plant height (cm), No. of tillers/plant, dry weight (g), yield and economic were recorded with standard process of observation. The data was statically analysed using analysis of variance (ANOVA) as applicable in Randomized Block Design (RBD) by Gomez and Gomez, 1984.

## RESULT AND DISCUSSION

### Effect on growth parameters

It is observed from Table.1, the plant height increased with crop growth duration. At 20DAS $T_5$ recorded maximum plant height of (3.08 cm), whereas $T_5$ recorded maximum plant height in rest of the growth stages *i.e*., at 40, 60, 80 DAS, and at harvest of 9.87, 54.99, 77.20 and 78.30cm respectively. At 40, 60, 80DAS and at harvest $T_2$- Line sowing + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS and $T_8$ - Line sowing + Vermicompost (4 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS was found statistically at par to $T_5$ - Line sowing + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS. The broadcasting method resulted in shortest plant as compared to the recorded in SWI and line sowing treatments. Sowing with proper plant density facilitates for sufficient aeration, moisture, sunlight and nutrient availability, leading toproper root system development from the early stages of crop growth (Abraham *et al*., 2014).Data regarding number of tillers/plant was recorded at all growth intervals *i.e*., 40, 60, 80 and at harvest (Table 2) treatment $T_6$*i.e*. SWI + Poultry manure (5 t/ha) + Panchagavya3% FS + Jeevamrutha 500 l/ha FS recorded maximum no. of tillers per plant 3.86, 8.56, 10.66 and 10.53, respectively. However, $T_3$ - SWI + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS and $T_9$- SWI + Vermicompost (4 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS was found statistically at par to $T_6$ - SWI + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS at 60, 80 and at harvest. Number of tillers was influenced significantly by different spacing and planting methods. SWI technique decreases the competition between the plants for light, water, space and nutrient hence there is increases number of tillers (Zeng *et al*., 2013).Table 3. Data pertaining to dry weight/plant was recorded and shown in Table 3. Significantly maximum dry weight/plant at 20, 40, 60, 80 and at harvest were noticed 0.14, 1.83, 8.27, 13.18 and 18.00 g/plant, respectively with treatment $T_6$, *i.e*. SWI + Poultry manure (5 t/ha) + Panchagavya 3% FS +Jeevamrutha 500 l/ha. At 20DAS, $T_9$- SWI + Vermicompost (4 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_5$ - Line sowing + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS and $T_2$ - Line sowing + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS at 60 and 80DAS$T_2$ - Line sowing + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS and at harvest $T_3$ - SWI + FYM (12 t/ha) +

Panchagavya3% FS + Jeevamrutha 500 l/ha FS, $T_9$ - SWI + Vermicompost (4 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS, $T_2$ -Line sowing + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS and $T_1$ - Broadcasting + FYM (12 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha was found statistically at par to $T_6$ - SWI + Poultry manure (5 t/ha) + Panchagavya 3% FS + Jeevamrutha 500 l/ha FS. Similar results found by (Alam, 2013) the cause of rapid increase of Dry weight at crop harvest or ripening stage was possibly due to emergence of number of new tillers per plant and more fertile spike per plant.

**Yield**

Data related to grain and straw yield were evaluated and tabulated in Table 4.Maximum Grain yield (3.16 t/ha) and Straw yield (4.48 t/ha) wasinfluenced significantly with application of treatment $T_5$ - Line sowing + Poultry manure (5 t/ha) + Panchagavya 3% + Jeevamrutha 500 l/ha whichsuperior over all the treatments except with the application of treatment $T_2$ - Line sowing + FYM (12 t/ha) + Panchagavya 3% + Jeevamrutha 500 l/ha in both parameters grain yield (2.99 t/ha) and straw yield (4.31 t/ha) were followed similar trend. Similar findings were reported in the higher yield may be due to the fact that these organic manures supply direct available nutrients such as nitrogen to the plants and these organic manures improve the portion of water holding stable aggregates of the soil (Channabaanagowda*et al*., 2008).

**Economics**

From Table 4. Organic sources of nutrients increased economic stability and returns, the cost of cultivation of wheat crop recorded numerically higher (₹64,235.00/ha) value for the treatment of application of SWI + Vermicompost (4 t/ha) + Panchagavya 3% + Jeevamrutha 500 l/ha and numerically minimum cost of cultivation was recorded with application of SWI + Poultry manure (5 t/ha) + Panchagavya 3% + Jeevamrutha 500 l/ha (₹46,835.00/ha). Numerically highest gross return (₹ 1,44,000.00/ha), net return (₹ 95,940.00/ha) and B:C ratio (1.99) were obtained with application of Line sowing + Poultry manure (5 t/ha) + Panchagavya 3% + Jeevamrutha 500 l/haamong all the treatments.

**Conclusion**

In summary, the findings of this study unequivocally demonstrate that the optimal combination for achieving maximum grain yield (3.16 t/ha), net returns (Rs 95,940.00/ha), and a commendable benefit-cost ratio (1.99) involves the strategic implementation of Line sowing in conjunction with PM (5 t/ha), Panchagavya at 3%, and Jeevamrutha at 500 l/ha. This superior performance clearly sets this specific treatment apart from all other interventions examined in the study. These results not only contribute

valuable insights to agricultural practices but also emphasize the significance of precision in cultivation methodologies for enhanced productivity and economic returns.

**Table 1: Effect of methods of sowing and organic manures on plant height (cm) of wheat**

| Treatments | Plant height (cm) | | | | |
|---|---|---|---|---|---|
| | 20 DAS | 40 DAS | 60 DAS | 80 DAS | At harvest |
| Broadcasting + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.54 | 7.58 | 48.76 | 70.33 | 72.57 |
| Line sowing + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.92 | 9.75 | 54.61 | 76.93 | 77.80 |
| SWI + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.72 | 8.83 | 51.27 | 71.23 | 72.90 |
| Broadcasting + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.16 | 7.23 | 49.82 | 72.60 | 74.43 |
| Line sowing + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.08 | 9.87 | 54.99 | 77.20 | 78.30 |
| SWI + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.65 | 8.65 | 51.13 | 72.34 | 73.70 |
| Broadcasting + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.33 | 7.18 | 46.52 | 68.70 | 70.26 |
| Line sowing + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.82 | 8.73 | 52.35 | 75.23 | 76.76 |
| SWI + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.46 | 8.23 | 49.74 | 69.63 | 71.93 |
| **SEm (±)** | 0.18 | 0.46 | 1.17 | 1.29 | 1.24 |
| **CD (5%)** | - | 1.37 | 3.50 | 3.85 | 3.68 |

**Table 2: Effect of methods of sowing and organic manures on no. of tillers per plant of wheat**

| Treatments | No. of tillers per plant | | | |
|---|---|---|---|---|
| | 40 DAS | 60 DAS | 80 DAS | At harvest |
| Broadcasting + FYM 12 t/ha +Panchagavya 3% + Jeevamrutha 500 L/ha | 2.53 | 4.70 | 5.54 | 5.43 |
| Line sowing + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.00 | 5.80 | 7.50 | 7.41 |
| SWI + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.80 | 8.43 | 10.40 | 10.26 |
| Broadcasting + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.43 | 5.53 | 5.94 | 5.70 |
| Line sowing + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.13 | 5.90 | 7.61 | 7.47 |
| SWI + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.86 | 8.56 | 10.66 | 10.53 |
| Broadcasting + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.20 | 5.06 | 5.80 | 5.58 |
| Line sowing + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.66 | 5.66 | 7.34 | 7.23 |
| SWI + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.70 | 8.16 | 10.34 | 10.23 |
| **SEm (±)** | 0.20 | 0.13 | 0.21 | 0.13 |
| **CD (5%)** | 0.63 | 0.41 | 0.64 | 0.41 |

**Table 3: Effect of methods of sowing and organic manures on dry weight (g/plant) of wheat**

| Treatments | Dry weight (g/plant) | | | | |
|---|---|---|---|---|---|
| | 20 DAS | 40 DAS | 60 DAS | 80 DAS | At harvest |
| Broadcasting + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.08 | 1.41 | 5.92 | 11.03 | 16.94 |
| Line sowing + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.10 | 1.53 | 6.54 | 11.90 | 17.01 |
| SWI + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.09 | 1.69 | 7.75 | 12.57 | 17.59 |
| Broadcasting + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.07 | 1.36 | 5.62 | 10.92 | 16.04 |
| Line sowing + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.11 | 1.59 | 7.04 | 11.69 | 16.71 |
| SWI + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.14 | 1.83 | 8.27 | 13.18 | 18.00 |
| Broadcasting + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.06 | 1.24 | 4.87 | 10.30 | 15.14 |
| Line sowing + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.08 | 1.45 | 6.34 | 11.03 | 16.02 |
| SWI + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 0.12 | 1.63 | 7.39 | 11.77 | 17.05 |
| **SEm (±)** | 0.01 | 0.04 | 0.26 | 0.37 | 0.35 |
| **CD (5%)** | 0.04 | 0.11 | 0.77 | 1.10 | 1.05 |

**Table 4: Yield and Economics of wheat by different methods of sowing and organic manures**

| Treatment | Grain yield (t/ha) | Straw yield (t/ha) | Cost of cultivation (INR $ha^{-1}$) | Gross returns (INR $ha^{-1}$) | Net returns (INR $ha^{-1}$) | B:C Ratio |
|---|---|---|---|---|---|---|
| Broadcasting + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.28 | 3.55 | 52,235.00 | 1,03,500.00 | 51,265.00 | 0.98 |
| Line sowing + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.99 | 4.31 | 52,060.00 | 1,35,000.00 | 82,940.00 | 1.59 |
| SWI + FYM 12 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.75 | 3.95 | 50,835.00 | 1,26,000.00 | 75,165.00 | 1.47 |
| Broadcasting + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.2 | 3.44 | 48,235.00 | 99,000.00 | 50,765.00 | 1.05 |
| Line sowing + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 3.16 | 4.48 | 48,060.00 | 1,44,000.00 | 95,940.00 | 1.99 |
| SWI + Poultry manure 5 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.66 | 3.92 | 46,835.00 | 1,21,500.00 | 74,665.00 | 1.59 |
| Broadcasting + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.12 | 3.37 | 64,235.00 | 94,500.00 | 30,265.00 | 0.47 |
| Line sowing + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.51 | 3.78 | 64,060.00 | 1,12.500.00 | 48,440.00 | 0.75 |
| SWI + Vermicompost 4 t/ha + Panchagavya 3% + Jeevamrutha 500 L/ha | 2.37 | 3.63 | 62,835.00 | 1,08,000.00 | 45,165.00 | 0.71 |
| **SEm (±)** | 0.05 | 0.05 | | | | |
| **CD (5%)** | 0.17 | 0.17 | | | | |

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