# EFFECT OF INTEGRATED NUTRIENT MANAGEMENT OF CHICKPEA (*Cicer arietinum L.*) UNDER TEAK (*Tectona grandis*) BASED ON AGROFORESTRY SYSTEM


## ABSTRACT

A field experiment was conducted in Rabi season during November 2022- March 2023 to find out the effect of integrated nutrient management of Chickpea (*Cicer arietinum L.*) at research field of College of Forestry, SHUATS, Prayagraj, UP. The experiment is laid out in Randomized Block Design (RBD) consisting of 7 treatments replicated thrice. Various treatments. Result revealed that at 30 DAS interval maximum plant height (19.80cm), at 60 DAS interval maximum plant height (46.43cm), at 90 DAS interval maximum plant height (52.51cm). at 30 DAS maximum number of branch (4.33), at 60 DAS maximum number of highest numbers of branch (8.67) and at 90 DAS maximum number of branches (12.33), the highest DAS to flowering (79.14), highest number of pods per plant (no.) (32.27), the highest number of seeds per pod (no.) (2.23), after harvesting the highest test weight (100 seed, hundred seed weight) (gm) (28.00), after harvesting highest grain yield q/ha (14.51). After harvesting highest straw yield q/ha (18.33), after harvesting the highest harvest index % (44.18) and maximum benefit cost ratio 2:91. While maximum gross return (154,855) and maximum net return (115,255). The highest recorded in the Treatment $T_7$ (0%NPK + 0%FYM + 100%VERMICOMPOST).



**Keywords:** Chickpea, NPK, FYM, VERMICOMPOST, Growth, Yield, Economics.


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## INTRODUCTION

In India 1950's, Green Revolution began with in-creased productivity of monocultures, however it has not solved the problem of food security of the indigenous people, which encouraged them for sustainable development to ensure food security. Traditional communities started following the agroforestry practices to grow more resilient, self-sufficient and to preserve bio-diversity (Goncalves *et. al.*, 2021). Further, the rise in the term 'Agroforestry 'was a form of ancient practices, where the trees were only the integral part of the farming system, the primary motive of these practices was food production not tree production (Nair, 1993). The term 'Agroforestry 'refers to cultivation of forest trees in combination with agricultural crops/livestock's or both with the beneficial effect of ecosystem. Agroforestry implies that where there is involvement of two or more species of plants/trees, animals and woody perennials (Nair, 1993).

As population increases, there is increase in pressure on food security paves the way for sustainable agricultural practices. Considering this realization in agricultural land use management along with better income, agroforestry came into existence (Rigueiro-Rodríguez *et. al.*, 2008). Then small landholders started reconsidering agroforestry as a dynamic, ecological and economical with the intention of developing sustainability along with improved farm productivity as well as welfare of their rural community (McMicken and Vergara, 1990). Unlike, other agricultural practices agroforestry is more knowledge intensive practice when compared to modern agricultural practices. Improved quality of seeds with good varieties, chemicals and various mechanical inputs are more considered in agroforestry practices (Mercer, 2004). Agroforestry is a multidisciplinary approach which involves the requirement of agronomist, soil scientist, forester, plant pathologist, economist social scientist, extension and further research departments (Dhyani,2009).

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## MATERIALS AND METHODS

Chickpea (*Cicer arietinum L.*) is an important pulse crop grown in all the regions of the world. It is world's third most important pulse crop after beans and peas. India is the largest producer of chickpea contributing highest share in area (65.3%) and production (67.2%) in the world (FAO, 2017). The chickpea is generally grown on rain-fed marginal and sub-marginal lands which are low in fertility and faces various biotic and abiotic stresses (Choudhary et al., 2015). Therefore, the productivity of chickpea in India is comparatively low as compared to other countries. Large scale use of only chemical fertilizers as a source of nutrients has less efficient and thus inorganic chemical fertilizers alone cannot sustain the soil productivity (Choudhary et al., 2014). In recent years bio fertilizers viz. Rhizobium and PSB along with organic manures that are ecofriendly and low-cost inputs have emerged as an important and integral component of integrated plant nutrient supply system for pulse crop production (Bana et al., 2016).

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**Table 1 Treatment combination details**

| TREATMENT | TREATMENT COMBINATION |
|---|---|
| T1 | Absolute control |
| T2 | @ 0%NPK+50%FYM+50%VERMICOMPOST |
| T3 | @ 50%NPK+ 50%FYM+0% VERMICOMPOST |
| T4 | @50%NPK+ 0%FYM+50% VERMICOMPOST |
| T5 | @100%NPK+0%FYM+0% VERMICOMPOST |
| T6 | @0%NPK+100%FYM+0% VERMICOMPOST |
| T7 | @ 0%NPK+0%FYM+100% VERMICOMPOST |

**RESULTS AND DISCUSSION**

The findings of the present experiment entitled, **"Effect of integrated nutrient management of Chickpea (*Cicer arietinum L.*) under Teak based agroforestry system"** was carried out at Forest Nursery and Research Centre, College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (UP) during Rabi season of 2021, are being presented and discussed in the following pages under appropriate headings. Data on pre-harvest and postharvest observations were statistically analyzed and discussion on experimental findings in the presence of scientific reasoning has been stated.

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**Plant height (cm)**

The data recorded on plant height have presented in table no 2 the analysis of data revealed that significant difference was found in plant height at 30,60 and 90 DAS The data maximum plant height at 30DAS was Recorded In T7 (19.80) followed by $T_6$(19.52) similarly, and minimum plant height was recorded In $T_4$(17.81) and at 60DAS The minimum was recorded In $T_7$ (46.43) followed by $T_3$(45.96) similarly, and minimum plant height was recorded In $T_1$(41.76) significant and at 90DAS The maximum plant was recorded In $T_7$(52.51) followed by $T_6$(52.01) similarly, and minimum plant height was recorded In $T_1$(48.10) data similarly Significant.

**Table 2 Effect of nutrient on Chickpea (*Cicer arietinum*) Plant height under Teak (*Tectona grandis*) based Agroforestry system at 30 DAS, 60DAS and 90 DAS.**

| Treatment | Plantheight(cm)30 DAS | Plant height (cm) 60 DAS | Plant height (cm) 90 DAS |
|---|---|---|---|
| **T1** | 17.91 | 41.76 | 48.10 |
| **T2** | 18.80 | 43.76 | 49.72 |
| **T3** | 19.63 | 45.96 | 50.51 |
| **$T_4$** | 17.81 | 43.83 | 50.11 |
| **$T_5$** | 19.11 | 42.73 | 51.10 |
| **$T_6$** | 19.52 | 43.40 | 52.01 |
| **$T_7$** | 19.80 | 46.43 | 52.51 |

| | | | |
|---|---|---|---|
| **Significant** | **S** | **S** | **S** |
| **C.D.** | 0.89 | 2.46 | 1.92 |
| **SE(m)** | 0.28 | 0.79 | 0.62 |
| **SE(d)** | 0.40 | 1.12 | 0.88 |
| **C.V.** | 2.64 | 3.14 | 2.13 |

**Number of branches**

The data recorded on Number of branches have presented in table no 3 the analysis of data revealed that significant difference was found in Number of branches at 30,60 and 90 DAS. The data maximum Number of branches at 30DAS was Recorded In $T_7$(4.33) followed by $T_6$ (4.01) similarly, and minimum Number of branches was recorded In $T_1$ (2.34) and at 60 DAS The maximum Number of branches was recorded In $T_7$(8.67) followed by $T_6$(8.34) similarly, and minimum Number of branches was recorded In $T_1$ (5.33) significant and at 90DAS The maximum Number of branches was recorded In $T_7$ (12.33) followed by $T_6$ (12.20) similarly, and minimum Number of branches was recorded In $T_1$(9.33) data similarly Significant.

**Table 3 Effect of nutrient on Chickpea (*Cicer arietinum*) Number of Branches under Teak (*Tectona grandis*) based Agroforestry system at 30 DAS, 60DAS and 90 DAS.**

| Treatment | Number of branches 30 DAS | Number of branches 60 DAS | Number of branches 90 DAS |
|---|---|---|---|
| **T1** | 2.34 | 5.33 | 9.33 |
| **T2** | 2.67 | 6.33 | 9.64 |
| **T3** | 3.63 | 6.66 | 10.33 |
| **$T_4$** | 3.01 | 7.01 | 11.33 |
| **$T_5$** | 3.33 | 7.33 | 12.01 |
| **$T_6$** | 4.01 | 8.34 | 12.20 |
| **$T_7$** | 4.33 | 8.67 | 12.33 |
| **Significant** | **S** | **S** | **S** |
| C.D. | 1.17 | 0.19 | 0.55 |
| SE(m) | 0.38 | 0.06 | 0.17 |
| SE(d) | 0.53 | 0.09 | 0.25 |
| C.V. | 20.68 | 1.55 | 2.81 |

**Table 4 Effect of nutrient on Chickpea (*Cicer arietinum*) Number of Days to Flowering under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Days to Flowering |
|---|---|
| **T1** | 78.57 |
| **T2** | 79.03 |
| **T3** | 77.63 |
| **T4** | 78.03 |
| **T5** | 76.59 |
| **T6** | 77.05 |
| **T7** | 79.14 |
| **Significant** | **S** |
| **C.D.** | 3.87 |
| **SE(m)** | 1.25 |
| **SE(d)** | 1.77 |
| **C.V.** | 2.81 |

**Number of Pods per Plant**

The data recorded on Number of Pods per Plant at 70 DAS have presented in table no 5 the analysis of data revealed that significant difference was found in Number of As per Plant. The data maximum Number of Pods per Plant was Recorded in $T_7$ (32.27) lowed by $T_6$ (30.80) similarly, and minimum Number of Pods per Plant was recorded In $T_1$ (26.34) data similarly significant.

**Table No. 5: Effect of nutrient on Number of Pods Per Plant of Chickpea (*Cicer arietinum*) the under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Number of Pods per Plant |
|---|---|
| **T1** | 26.34 |
| **T2** | 27.65 |
| **T3** | 29.27 |
| **$T_4$** | 27.87 |
| **$T_5$** | 25.60 |
| **$T_6$** | 30.80 |
| **$T_7$** | 32.27 |
| **Significant** | **S** |
| **C.D.** | 19.25 |
| **SE(m)** | 6.24 |
| **SE(d)** | 8.83 |
| **C.V.** | 35.11 |

**Number of Seeds per Pod**

The data recorded on Number of Seeds per Pod have presented in table no 6 the analysis s of data revealed that significant difference was found in Number of Seeds per Pod. The data maximum Number of Seeds per Pod was Recorded in $T_7$ (2.23) followed by $T_6$ (1.91) similarly, and minimum Number of Seeds per Pod was recorded In $T_1$ (1.03) data similarly significant.

**Table 6 Effect of nutrient on Number of Seeds per Pod of Chickpea (*Cicer arietinum*) under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Number of Seeds per Pod at 70 DAS |
|---|---|
| **T1** | 1.03 |
| **T2** | 1.11 |
| **T3** | 1.23 |
| **T4** | 1.64 |
| **T5** | 1.76 |
| **T6** | 1.91 |
| **T7** | 2.23 |
| **Significant** | **S** |
| **C.D.** | 0.25 |
| **SE(m)** | 0.08 |
| **SE(d)** | 0.11 |
| **C.V.** | 9.32 |

**Test Weight (100 seed, hundred seed weight) (No)**

The data recorded on Test weight (100 seed, Hundred-Seed Weight) (No) after harvesting have presented in table no 7 the analysis of data revealed that significant difference was found in Test weight (100 seed, Hundred-Seed Weight) (No). The data maximum Test weight (100 seed, Hundred-Seed Weight) (No) was Recorded in $T_7$ (28.00) followed by (27.40) similarly, and minimum Test weight (100 seed, Hundred-Seed Weight) (No) was recorded In $T_1$ (22.00) data similarly Significant.

**Table No.7: Effect of nutrient on Test Weight of 100 seed Chickpea (*Cicer arietinum*) under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Test Weight (100 seed, hundred seed weight) (gm) after harvesting |
|---|---|
| **T1** | 22.20 |
| **T2** | 23.10 |
| **T3** | 25.46 |
| **T4** | 26.33 |
| **T5** | 24.63 |
| **T6** | 27.40 |
| **T7** | 28.00 |
| **Significant** | S |
| C.D. | 0.97 |
| SE(m) | 0.31 |
| SE(d) | 0.44 |
| C.V. | 2.16 |

**Grain Yield. q/ha.**

The data recorded on Grain Yield. q/ha after harvesting have presented in table no 8 the analysis of data revealed that significant difference was found in Grain Yield. a. The data maximum Grain Yield. q/ha was Recorded in $T_7$ (14.51) followed by $T_6$ (13.76) similarly, and minimum Grain Yield. kg/ha was recorded In $T_1$ (9.38) data similarly Significant.

**Table No. 8: Effect of nutrient on Grain Yield of Chickpea (*Cicer arietinum*) under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Grain Yield. q/ha. After harvesting |
|---|---|
| **T1** | 9.38 |
| **T2** | 10.36 |
| **T3** | 11.02 |
| **T4** | 11.32 |
| **T5** | 12.66 |
| **T6** | 13.76 |
| **T7** | 14.51 |
| **Significant** | **S** |
| **C.D.** | 2.44 |
| **SE(m)** | 0.81 |
| **SE(d)** | 1.15 |
| **C.V.** | 8.81 |

**Straw Yield q/ha**

The data recorded on Straw Yield. q/ha after harvesting have presented in table no 9 the analysis of data revealed that significant difference was found in Straw Yield. 9h. The data maximum Straw Yield. q/ha was Recorded in $T_7$ (18.33) followed by $T_6$ (17.33) similarly, and minimum Straw Yield. q/ha was recorded In $T_1$ (12.00) data similarly Significant.

**Table No. 9:Effect of nutrient on Straw Yield of Chickpea (*Cicer arietinum*) under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Straw Yield. q/ha. After harvesting |
|---|---|
| $T_1$ | 12.00 |
| $T_2$ | 13.33 |
| $T_3$ | 14.00 |
| $T_4$ | 15.67 |
| $T_5$ | 16.00 |
| $T_6$ | 17.33 |
| $T_7$ | 18.33 |
| Significant | S |
| C.D. | 2.20 |
| SE(m) | 0.73 |
| SE(d) | 1.04 |
| C.V. | 7.28 |

**Harvest Index %**

The data recorded on Harvest Index % have presented in table no 10 the analysis of data revealed that non-significant difference was found in Harvest Index %. The data maximum Harvest Index % was Recorded in $T_7$ (44.18) followed by $T_6$. (44.05) similarly, and minimum Harvest Index % was recorded In $T_4$ (42.24) data similarly non-Significant.

**Table No. 10: Effect of nutrient on the Harvest index of Chickpea (*Cicer arietinum*) under Teak (*Tectona grandis*) based Agroforestry system.**

| Treatment | Harvest Index % |
|---|---|
| $T_1$ | 43.87 |
| $T_2$ | 43.73 |
| $T_3$ | 44.04 |
| $T_4$ | 42.24 |
| $T_5$ | 44.17 |
| $T_6$ | 44.05 |
| $T_7$ | 44.18 |
| Significant | NS |
| C.D. | 5.93 |
| SE(m) | 1.98 |
| SE(d) | 2.80 |
| C.V. | 7.14 |

**Post-Harvest Observations:**

**Grain Yield. q/ha**

The analysis of data revealed that significant difference was found in Grain Yield. q/ha maximum Grain Yield. q/ha was Recorded in $T_7$ (14.51) followed by $T_6$ (13.76) similarly, and minimum Grain Yield. q/ha was recorded In $T_1$ (9.38) data similarly Significant.

**Straw Yield. q/ha**

The analysis of data revealed that significant difference was found in Straw Yield. q/ha. The maximum Straw Yield. q/ha was Recorded in $T_7$ (18.33) followed by $T_6$ (17.33) similarly, minimum Straw Yield. q/ha was recorded In $T_1$ (12.00) data similarly Significant.

**Harvest Index %**

The analysis of data revealed that non-significant difference was found in Harvest Index %. The data maximum Harvest Index % was Recorded in $T_7$ (44.18) followed by $T_6$ (44.05) similarly, and minimum Harvest Index % was recorded In $T_4$ (41.72) data similarly non-Significant.

## CONCLUSION

The experiment trail of my study entitled "Effect of Integrated nutrient management of Chickpea (Cicer arietinum L.) under Teak based agroforestry system" it was concluded that the treatment combination $T_7$ (0%NPK+0%FYM+100% VERMICOMPOST) was found to best in term of Growth and Yield. recorded significantly higher Gran yield (kg/ha), gross return (ha), net return (ha) and benefit cost ratio (2.91) It could be recommended for profitable cultivation of Chickpea These findings are based on one season; therefore, further trail may be required for further confirmation.

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**References**


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