**Effect of medium type of varieties and organic sources of nutrients on growth, yield and economics of Kabuli Chickpea (Cicerkabulium L.) under Bundelkhand region.**


## ABSTRACT

The present investigation entitled **"Effect of medium type of varieties and organic sources of nutrients on growth, yieldand economics of Kabuli Chickpea (Cicerkabulium L.) under Bundelkhand region''** was carried out at the Organic Research Farm at Karguaji, Institute of Agricultural Sciences Bundelkhand University, Jhansi (U.P.) during Rabi season of the year 2020-21. The experiment was laid out in a factorial randomized block design with three organic sources of nutrients such as, FYM, Vermicompost and Poultry manure and comprising three varieties viz Pusa-1053, Shubhra and Ujjaval replicated thrice. All the organic sources and sowing methods significantly influence the all parameters like Growth parameters viz., plant height, root length, numbers of primary branches, secondary branches plant-1 at 30, 60 and 90 DAS and at maturity, fresh weight of shoot, fresh weight of root, dry weight of shoot and dry weight of root plant-1, crop growth rate g/m2 /day-1 and moisture % were noticed at 30, 60 and 90 DAS. The nutrients management through organic source and different varieties significantly influenced the entire yield attributes viz, number of pod plant$^{-1}$, pod weight plant$^{-1}$, grain weight plant$^{-1}$ and 100 seed weight were recorded with V1-PUSA-1053 and M2- Vermicompost while M1- FYM and V2- Shubhra recorded lowest in all the parameters. Maximum seed yield per hector were also obtained through higher seed yield (25.43kg/ha) was recorded in variety V1 - Pusa 1053 and higher seed yield (22.12kg/ha) was found in M2- Vermicompost application, respectively. From present investigation, it can be concluded that above nutrients management through organic manures (vermicompost) and varieties PUSA-1053 resulted in better growth, higher yield attributes and better yield besides enhanced soil health as evident by post-harvest soil fertility status. It can be suggested as a cost effective combination for getting higher yield with greater quality of kabuli chickpea on organic farming system for the farmer's Bundelkhand region of Uttar Pradesh.



**Keywords:-**Cost effective.Kabuli chickpea, Organic farming, Organic manure, Pusa- 1053, and yield.

**Introduction -**

Chickpea [Cicerarietinum (L.)] belongs to genus Cicer, tribe Cicereae, family Fabaceae, and subfamily Papilionaceae. It originated in south-eastern Turkey (Ladizinsky, 1975). Chickpea is also called garbanzo (Spanish), poischiche (French), kichar or chicher (German), chana (Hindi), and gram or Bengal gram (English). India is the largest producer of chickpea and contributes 70% of world's chickpea production (Muehlbauer and Sarker,2017). In India, chickpea is grown in 22 states and two union territories and accounts for 35 % of total area under pulses and 45 % of total pulse production in India (Singh, 2014). Although area under this crop has seena gradual increase from 7.57 million hectares in 1950-51 to 9.93 million hectares in 2013-14 with a productivity rise from 4.82 q $ha^{-1}$ to 9.60 q $ha^{-1}$ in this period (FAOSTAT, 2018), the seed replacement rate of chickpea isstill very low (23.3%) (Singh, 2014). Against a requirement of 6.3 millionquintals of chickpeas seeds each season, only 1.25 million quintals of quality seed is available to the farmers (Singh, 2014). Chickpea crop isrecognized for itsresilience under restricted water availability. Chickpea seeds are large in size, salmon-white in colour and contain high levels of carbohydrate (41.1–47.4%) and protein (21.7- 23.4%). The protein content (22.9–24.8%) of chickpeas was much higher than that of cereals (wheat and maize) and comparable to other legumes (Wood and Grusak, 2007). Protein concentration generally varies by only a small magnitude between desi and kabuli market classes. Chickpea protein concentration ranges from 160 to 300 g $kg^{-1}$ and from 120 to 290g $kg^{-1}$ for desi and kabuli market classes, respectively (Frimpong, et al., 2009). Chickpea isa good source of carbohydrates and protein, together constituting about 80% of the total dry seed mass (Chibbar, et al., 2010) in comparison with other pulses. Chickpea is consumed as whole seed, dhal (decorticated splitcotyledons) or dhal flour (Frimpong, et al., 2009). In organic farms, chickpea plays an extremely important role in crop rotation because it have the ability to live in symbiosis with rhizobiathat fix free atmospheric nitrogen ((Pociejowska, et al., 2013). The use of chickpeas in an organic farm is justified by its ability to fix atmospheric nitrogen. Kabuli chickpea is one of the two types of chickpea (desi and kabuli) which has cream-coloured large seed with a thin seed coat, in contrast to desi type which has darker-coloured small-sized seed with a thick seed coat. In Kabuli chickpea, a plant population of 40-45 plants m- 2 provides high grain yields (Gan et al., 2003). Inadequate plant population is one of the important factors responsible for poor grain yields of chickpea (Nagarajaiah et al., 2005). Poorplant stand could be due to use of low seed rate, poor

quality seed, insufficient moisture at sowing, plant mortality due to various diseases or salinity or moisture stress, etc. Adequate plant population may be maintained by using good quality optimum seed rate. However, seed is a costly input and need to be used judiciously as it involves lot of money. Further, as chickpea is generally grown under one or the other stress conditions on marginal soils, the risk of the crop failure discourages farmers to use costly inputs including the use of high seed rate.

## MATERIALS AND METHODS

A field experiment was carried at Organic Research Farm, Karguaji, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.). to study Effect of medium type of varieties and organic sources of nutrients on growth, yield and economics of Kabuli chickpea (Cicerkabulium L.) under Bundelkhand region of Uttar Predesh" during *Rabi*season of 2020-2021.The climatic condition under Jhansi district of Uttar Pradesh is subtropical. The total rainfall received during the crop-growing period was 128 mm. The weekly maximum and minimum temperature during the experimental period ranged from 21.0°C to 35.1°C and 5.2°C to 15.1°C, respectively. The soil of the experimental plot was sandy clay loamwith low organic carbon (0.45%), low in available nitrogen (164 kg $ha^{-1}$) and available potassium (235 kg/ha) but high in available phosphorus (28.5 kg/ha). The soil reaction of the experimental field was nearly neutral (*p*H 7.2) with an electrical conductivity of 0.26 ds/m.

The experiment was laid out in factorial randomized block design, with 3Kabuli Chickpea varieties PUSA-1053, Subhra and Ujjaval and 3 organic sources of nutrients 100 % N through FYM, 100 % N through Vermicompost, 100 % N through Poultry manure, 100 % N through Poultry manure. The Chickpea seeds were treated with Rhizobium culture and sown in well-prepared land by dibbling method with seed rates of 80 kg $ha^{-1}$. A spacing of 30 x 10 was adopted. Nitrogen was applied at the rate of 20 kg $ha^{-1}$FYM 0.5 per cent N, vermicompost, poultry content is 3.03 per centThe crop was grown under rainfed condition with one pre-sowing irrigation was applied to the crop 7 days before sowing and only one lifesaving irrigation was applied. Weeding was done with the help of drylandweeder between the crop rows at 30 days and 45 days after sowing. Crops was Harvested manually with sickle and tied in bundles with tags from each plot and left for sun drying. Threshing operations were also performed treatment

wise manually. The growth parameters, *viz.* plant height (cm), fresh weight/plant (g/plant), dry matter/plant (g/plant) and CGR at the 30, 60 and 90 DAS of chickpea Various yield parameter, *viz*. seed yield (kg/ha), Stover yield (kg/ha) and harvest index and equivalent yield at the time of harvesting of chickpea. The data on various parameters were statistically analysed by using CPCS-1 (Cochran and Cox, 1967).

## RESULTS AND DISCUSSION

### Growth parameters of Mustard

### Plant height (cm),primary and secondary branches:

The plant height, primary and secondary branches of V1 - Pusa-1053 were significantly higher as compared to theother varieties,plant height of chickpea was maximum between 60 to 90 DAS while minimum, between 90 DAS to maturity stage,primary and secondary branches representing at 30, 60, 90 DAS and at maturity stage. Which was significantly higher than V2- Subhra, V3 -Ujjal. Application of organic manures significantly influenced plant height number of primary and secondary branches per plant at all the stages. The maximum plant height number of primary and secondary was recorded with M2- Vermicompost, which was significantly better than Poultry manure, and M1- FYM, application. Interaction effect of different varieties and application of organic sources was found to be non-significant. Increase in plant height is due to genetic potential while primary and secondary branches could be attributed to the higher production of plant growth promoting factors by beneficial microbial inoculants present in organic manures which might have resulted in more intense root system and increased shoot growth by enhanced nutrient uptake (Singh and Sharma 2011).

### Fresh weight and Dry weight (g) shoot and root per plant

It is apparent from the data that the significantly higher fresh weight and dry weight of shoot (g) and root per plant were recorded with the variety V1 -Pusa-1053, (20.21g) compared to V3 - Ujjaval, (19.79 g) and V2- Subhra, (19.46 g) at 60 DAS It might be due to the to genetic potential which led to higher photosynthetic assimilation and as a result plant growth improved and led to higher accumulation of dry matter. Maleki et al. (2010)

Among the nutrient application of organic manure significantly influence Fresh weight and Dry weight (g) of shoot and root per plant at all the stages whereas the highest weight was recorded with M2- Vermicompost (19.95 g) followed by M3- Poultry manure (19.81 g) and minimum was recorded under M1- FYM (19.70 g), at 60 DAS. Interaction effect of different varieties and application of organic manure was found to be non- significant Jat and Ahlawat (2004) reported that application of vermicompost resulted in higher dry matter accumulation. It might be due to the fact that vermicompost contained all the essential plant nutrients and gave steady supply of these nutrients during entire crop period, which ultimately increased the dry matter accumulation of plants.

**Crop growth rate (g/m$^2$ /day)**

the maximum crop growth rate (g/m2 /day) was recorded with the variety V1 - Pusa-1053, (5.75 and 3.59 g/m2 /day) followed by V3 - Ujjaval, representing (5.51 and 3.43 g/m2 /day), respectively at 60 and 90 DAS. It was minimum with the variety V2 -Subhra, presented (5.31 and 3.26 g/m2 /day) at 60 and 90 DAS. The difference between varieties were found significant. application of organic source of nutrients significantly influenced crop growth rate (g/m2 /day) per plant at all the stages and showed maximum with M2- Vermicompost, representing (5.61 and 3.48 g/m2 /day) followed by M3- Poultry manure, representing (5.52 and 3.41 g/m2 /day) respectively at 60 and 90 DAS. Minimum were recorded under M1- FYM representing (5.44 and 3.36 g/m2 /day), respectively at 60 and 90 DAS. All the differences between organic sources of nutrients were found significant. Interaction effect of different varieties and application of organic manures found to be non- significant.

**Yield attributes and yield**

The variety V$^1$- Pusa- 1053 resulted in significantly more number of pods/plant (35.58), Seeds/pod (1.43) grain weight/plant (14.96) and 100 seed weight (18.55), over V$^3$- Ujjaval and V$^2$- Subhra. The differences between verities were found significant. Whereas in case of organic manure M2- Vermicompost resulted in significantly more number of pods/plant (31.88), Seeds/pod (1.36) grain weight/plant (14.74) and 100 seed weight (18.34), which was at par with M3- Poultry manure representing, and M1- FYM. Siag and Yadav (2004) who reported that

application of vermicompost resulted in more pods per plant. Interaction effect of different varieties and application of organic manures was found to be non- significant.

The yield attributeswas found to be significant maximum biological yield, seed yield (q/ha), straw yield (q/ha) and harvest index was recorded with the variety V1 -Pusa 1053which was statistically superior over V3 -Ujjaval, (19.85 kg/ha). And V2 -Subhra, (15.14 kg/ha). All the differences between verities were found significant. Whereas in case of organic manure it is clear from the (table 1.3) that significantly higher biological yield, seed yield (q/ha), straw yield (q/ha) was recorded in M2- Vermicompost compared to FYM which was at par with Poultry manure (20.39 kg/ha). Interaction effect of different varieties and application of organic manures were found to be non- significant.This increase in yield occurred due to an increase in growth and development of chickpea crop with application of vermicompost or it might be due to the better availability of nutrients throughout the crop growth that ultimately improved the growth and yield contributing characters of chickpea and hence resulted in higher seed yield.

**Conclusion**

The findings of this study indicate that kabuli chickpea varieties can successfully can be grown by using vermicompost.variety- Pusa-1053 and use of Vermicompost as source nutrients can be suggested as a cost-effective combination for getting higher yield of Kabuli chickpea in Bundelkhand region of Uttar Pradesh.

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Table 1. Primary and secondary branches in different treatment efficacy

| Treatment | Plantheight(cm) | | | | No. of primary branches | | | | No.of secondary branches | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30DAS | 60DAS | 90DAS | Maturity | 30DAS | 60DAS | 90DAS | Maturity | 30DAS | 60DAS | 90DAS | Maturity |
| **Varieties** | | | | | | | | | | | | |
| **V1-Pusa-1053** | 12.17 | 27.91 | 45.81 | 54.25 | 1.37 | 3.92 | 4.34 | 4.42 | 2.18 | 6.35 | 6.87 | 6.97 |
| **V2-Subhra** | 10.53 | 25.26 | 41.83 | 50.16 | 1.22 | 3.51 | 3.64 | 3.77 | 2.42 | 5.77 | 6.34 | 6.46 |
| **V3-Ujjaval** | 11.74 | 27.76 | 43.84 | 52.39 | 1.29 | 3.71 | 3.94 | 4.04 | 2.65 | 6.03 | 6.58 | 6.74 |
| **SE(m)±** | 0.13 | 0.20 | 0.38 | 0.51 | 0.01 | 0.02 | 0.02 | 0.04 | 0.03 | 0.06 | 0.06 | 0.07 |
| **CDat5%** | 0.40 | 0.59 | 1.15 | 1.51 | 0.04 | 0.07 | 0.06 | 0.12 | 0.09 | 0.18 | 0.19 | 0.22 |
| **Organicsourcesofnutrients** | | | | | | | | | | | | |
| **M1-FYM** | 11.06 | 26.07 | 43.24 | 51.76 | 1.27 | 3.64 | 3.89 | 3.97 | 2.59 | 5.96 | 6.52 | 6.63 |
| **M2-Vermicompost** | 11.68 | 27.17 | 44.39 | 52.87 | 1.32 | 3.78 | 4.09 | 4.18 | 2.70 | 6.14 | 6.68 | 6.81 |
| **M3-Poultrymanure** | 11.43 | 26.72 | 43.86 | 52.16 | 1.29 | 3.70 | 4.00 | 4.07 | 2.64 | 6.05 | 6.59 | 6.73 |
| **SE(m)±** | 0.12 | 0.19 | 0.37 | 0.50 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.05 | 0.06 | 0.07 |
| **CDat5%** | 0.38 | 0.57 | 1.13 | 1.50 | 0.03 | 0.06 | 0.05 | 0.15 | 0.07 | 0.15 | 0.18 | 0.20 |
| **InteractionV×M** | | | | | | | | | | | | |
| **SE(m)±** | 0.22 | 0.34 | 0.66 | 0.87 | 0.02 | 0.04 | 0.03 | 0.07 | 0.05 | 0.09 | 0.11 | 0.12 |
| **CDat5%** | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S | N.S. | N.S. | N.S. |

**Table 2. Biomass accumulation and Crop growth rate in different varieties**

| Treatment | Biomass accumulation (g) per plant at 60 DAS | | | | Crop growth rate (g/m$^2$ /day) | |
|---|---|---|---|---|---|---|
| | Fresh weight of shoot | Fresh weight of root | Dry weight of shoot | Dry weight of root | 30-60 DAS | 60-90 DAS |
| **Varities** | | | | | | |
| **$V_1$-Pusa-1053** | 79.67 | 19.74 | 20.21 | 3.71 | 5.75 | 3.56 |
| **$V_2$-Subhra** | 68.82 | 18.91 | 19.46 | 3.37 | 5.31 | 3.26 |
| **$V_3$-Ujjaval** | 75.73 | 19.45 | 19.79 | 3.54 | 5.51 | 3.41 |
| **SE(m)±** | 0.52 | 0.12 | 0.14 | 0.03 | 0.05 | 0.03 |
| **CDat5%** | 1.56 | 0.39 | 0.42 | 0.09 | 0.15 | 0.09 |
| **Organicsourcesofnutrients** | | | | | | |
| **$M_1$-FYM** | 73.11 | 18.26 | 19.70 | 3.49 | 5.44 | 3.36 |
| **$M_2$-Vermicompost** | 76.77 | 19.46 | 19.95 | 3.59 | 5.61 | 3.48 |
| **$M_3$-Poultrymanure** | 74.33 | 19.37 | 19.81 | 3.54 | 5.52 | 3.41 |
| **SE(m)±** | 0.51 | 0.12 | 0.13 | 0.02 | 0.04 | 0.02 |
| **CDat5%** | 1.54 | 0.35 | 0.38 | 0.07 | 0.13 | 0.07 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **InteractionV×M** | | | | | | |
| **SE(m)±** | 0.89 | 0.22 | 0.25 | 0.06 | 0.08 | 0.05 |
| **CDat5%** | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |

## Table 3. Yield attributes in different treatment modalities

| **Treatment** | **Yieldattributes** | | | |
|---|---|---|---|---|
| | **Noofpods/plant** | **Noofseed/pod** | **Grainweight/ plant** | **100seed weight** |
| **Varieties** | | | | |
| **$V_1$-Pusa-1053** | 35.58 | 1.43 | 14.96 | 18.55 |
| **$V_2$-Subhra** | 26.41 | 1.24 | 14.29 | 17.42 |
| **$V_3$-Ujjaval** | 30.47 | 1.32 | 14.29 | 18.21 |
| **SE(m)±** | 0.22 | 0.01 | 0.13 | 0.17 |
| **CDat5%** | 0.66 | 0.03 | 0.39 | 0.51 |
| **Organicsourceofnutrients** | | | | |
| **$M_1$-FYM** | 29.67 | 1.30 | 14.52 | 18.04 |
| **$M_2$-Vermicompost** | 31.88 | 1.36 | 14.74 | 18.34 |
| **$M_3$-Poultrymanure** | 30.91 | 1.33 | 14.73 | 18.18 |
| **SE(m)±** | 0.21 | 0.01 | 0.10 | 0.12 |
| **CDat5%** | 0.64 | 0.02 | 0.31 | 0.34 |
| **InteractionV×M** | | | | |
| **SE(m)±** | 0.37 | 0.2 | 0.22 | 0.29 |

| | | | | |
|---|---|---|---|---|
| **CDat5%** | N.S. | N.S. | N.S. | NS |

**Table No.-3**