Effect Of Integrated Nutrient Management In Chickpea *(Cicer Arietinum* L.*)*

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ABSTRACT
The current investigation, which is **"Effect of Integrated nutrient management in chick pea (*Cicer arietinum* L.) "** was carried out at farm of Uttaranchal University, Uttaranchal University, Dehradun, Uttarakhand, India during 2021-2022, with the objectives to evaluate the effect of inorganic and organic fertilizer on the growth and yield of chickpeas, To study the effect of inorganic and organic fertilizer on soil physical, chemical and biological properties and To work out the economics of various treatments. The treatments involved in the investigation are T_1 Control (100%) RDF, T_2 75% RDF + Vermicompost, T_3 50% RDF + Vermicompost, T_4 75% RDF + *Rhizobium*, T_5 50% RDF + *Rhizobium*, T_6 75% RDF + Vermicompost + *Rhizobium*, T_7 50% RDF + Vermicompost + *Rhizobium* with the statistical design of RBD. Observations are drawn out in different growth parameters viz., Plant height (48.83), no of branches per plant (4.33), no of nodules per plant (13.67), no of pods per plant (28.67), no of seeds per pod (1.93), Seed yield (1224.67 g). From all the results drawn through statistical analysis maximum significance has been found out in the treatments T_6 (75% RDF + Vermicompost + *Rhizobium*) and T_2 (75% RDF + Vermicompost) which results in the beneficial output for growth and yield of the crop.

Keywords: Chickpea, INM, Vermicompost, R*hizobium*, Growth and Yield.

INTRODUCTION:

Chickpea (*Cicer arietinum* L.) belongs to the family Fabaceae, an important protein-rich legume plant **(Wafula *et al.,* 2022)**. Chickpea is a cool season pulses plant developed all around the world as a food crop. Seeds are an essential edible component of a plant. Known as sanagalu (Telugu) and chana (Hindi, Urdu). It is an excellent source of protein (18-22%), carbohydrates (52-70%), fats (4-10%), minerals such as calcium, phosphorus, iron, etc., and vitamins. It is an excellent animal feed and its grass has a good amount of fodder **(Prasad *et al.,* 2012).** To improve the productivity of this plant, the use of a balanced fertilizer with natural fertilizers, N, P, K and biofertilizers *i.e.,* Rhizobium, and vermicompost is very important. The inclusion of pulses with PGPR and Rhizobium causes growth of plant growth and improves crop yields. Farmyard manure is an important source of organic matter and nutrients that after decay microorganisms are found in the plant **(Singh *et al.,* 2018)**. Integrated nutrient management is primarily aimed at maintaining or improving fertility of soil in consequences of the provision of nutritious to a high standard in order to maintain desirable yield of crop by maximizing the profit of all possible plant nutrient resources in a assimilate manner. The basic goal of INM is to maintain soil fertility, sustainable agriculture, productivity, and improve farmer productivity through efficient and effective mineral fertilizers, organic fertilizers, bio-fertilizers, green manure, and crop residues.

Use of Rhizobium can be very helpful due to its unique properties such as low cost, natural friendliness and easy-to-use nutrients especially N in the soil system. In addition, to improve plant quality and maintain soil health. Rhizobium has the one-of-a-kind capacity to change over environmental dinitrogen into ammonia through biological nitrogen fixation (BNF) process **(Michiels and Vanderleyden 1994).** The low cost of injecting Rhizobium and the high return from the BNF process are some of the reasons for the worldwide use of Rhizobium injections in various legume plants **(Shantharam and Tattoo 1997).** Compost delivered by conventional cycles is for the most part low in plant supplement content and the actual interaction is additionally sluggish and tedious. Then again, certain extraordinary kind of worm (*Eisenia fetida*) has the ability to change over the biodegradable natural waste into better fertilizer at relatively quicker rate **(Bhattarai *et al.,* 2003)** than that of the customary technique. Such a manure generally known as "vermicompost" is wealthy in plant supplements and contains bigger number of microorganisms, which are answerable for disintegration process **(Yami *et al.,* 2003)**.

MATERIALS AND METHODS:

A field test was carried out during *Rabi* season at the farm of School of Agriculture, Uttaranchal University, Dehradun, Uttarakhand, India during 2022. The test area was sandy loam with soil pH (8.0), Nitrogen (256 kg/ha), Phosphorus (25.8 kg/ha), Potassium (205.2 kg/ha) and organic carbon (0.90%). The test was planned out in Randomized Block Design (RBD) with 7 Treatments and three Replications. Treatments were T_1 (Control (100%) RDF), T_2 (75% RDF + Vermicompost), T_3 (50% RDF + Vermicompost), T_4 (75% RDF + *Rhizobium)*, T_5 (50% RDF + *Rhizobium)*, T_6 (75% RDF + Vermicompost + *Rhizobium)*, T_7 (50% RDF + Vermicompost + *Rhizobium).* Recommended dose of Fertilizers 25:50:00 (N_2:P_2O_5: K_2O). Nitrogen was adjusted by urea, DAP and communicated consistently according to the treatment. Phosphorus adjusted by DAP was given as basal portion at the season of planting. The chickpea variety PUSA – 362 was planted at 30×10 cm spacing. Seed infusing was done with *Rhizobium.* The findings on plant height, no of branches per plant, no of pods per plant, no of seeds per plant, seed yield.

RESULT AND DISCUSSION:

The aftereffects of the current review have been introduced also, examined under the accompanying headings:

Plant height:

The treatment T_6 (75% RDF + vermicompost + rhizobium) showed that highest plant height (48.33 cm) and the lowest plant height showed by treatment T_1 (control (100%)) (45.29 cm) at harvest. The rising in plant length may be expected to rise in photosynthetic activity, active distribution and use of photosynthate resulting in rapid cell proliferation and cell division in the growing plant area leading to increased growth, without increased nutrient uptake **(Dicks *et a*l., 1980).**

No of branches per plant:

The range of branches per plant were recorded highest at treatment T_6 (75% RDF + vermicompost + rhizobium) (4.33) followed by treatment T_2 (75% RDF + vermicompost) (4.0) while least number of branches per plant recorded at T_1 (control (100%)) (3.00). The maximum number of branches depends on the growth of the vegetable and the growth of the plants which selects the higher plant height and as a result, as a result of all the tall plants the number of branches grows. The combination of chemical fertilizers and biofertilizer increases the availability of essential nutrients that affect plant growth and as a result vegetable growth increases the number of branches. The grow in the no of branches per plant to the growing level of biofertilizer and fertilizers might be expected to improved availability of nutrient which has improved flat stretch of the chickpea by promoting division of cells in a cooler environment. These findings were previously reported by **Patel and Thanki, (2020).**

No of Pods per plant:

No of pods per plant was increased outstandingly under those treatments where source both the organic and inorganic fertilizers. The maximum number of pods per plant recorded in treatment T_6 (75% RDF + vermicompost + *Rhizobium*) (28.67) followed by treatment T_2 (75% RDF + Vermicompost) (28.33). while minimum number of pods per plant recorded at T_1 (control (100%)) (24.67). The no of pods is mainly controlled by the no of branches rising with expanding levels of nutrients, leading to a rise in the no of pods per plant. With the high use of fertilizers or biofertilizers, the process of tissue separation from somatic to reproductive, meristematic activity and early flower maturing may have improved resulting in more flowers later emerging from the pods. It is therefore recognized that the development brought about as a result of high nutrient intake provides proper nutrition during the growing season and facilitates the effective growth of reproductive organs. These findings are described by **Singh and Singh (1994) and Arunachalam *et al.*, (1996).**

Seeds per pod:

Seeds per pod recorded in treatment T_6 (75% RDF + vermicompost + *Rhizobium*) (1.93) followed by treatment T_2 (75% RDF + vermicompost) (1.80). while least number of seeds per pod recorded at T_1 (control (100%)) (1.13). Seeds per plant are important in the yield parameter, with the increase in nutrient levels, which leads to an increase in plant length, number of branches per plant, legumes per plant and seeds per plant. With high fertilizer application, the seeds per plant are likely to multiply. Under high nutrient uptake, there may be an effective transfer of photosynthesis from leaf stems to pod and seed stem area. This results in a higher no of seeds per plant. These encounters are accounted for by **Singh *et al.*, (1994) and Arunachalam *et al.*, (1996).**

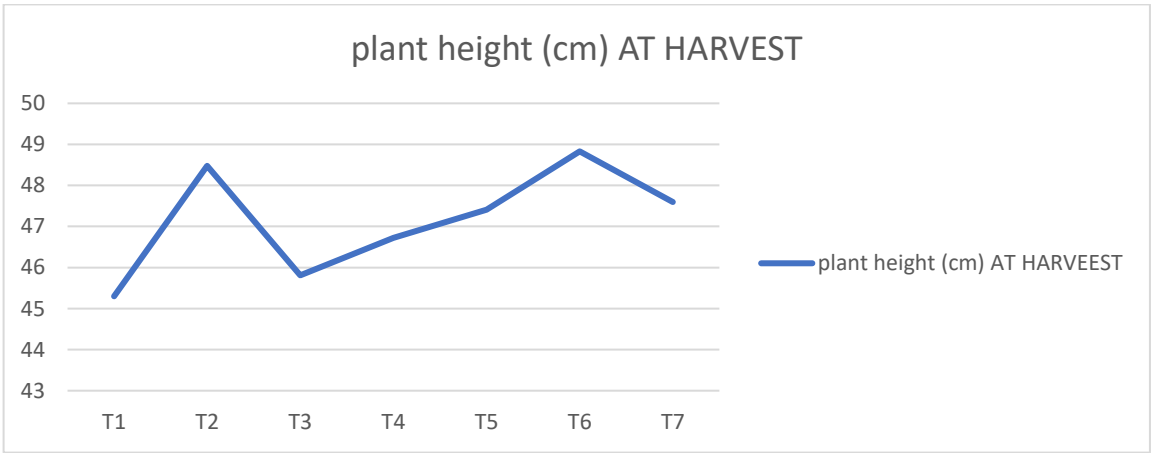
Seed yield per plot (g):

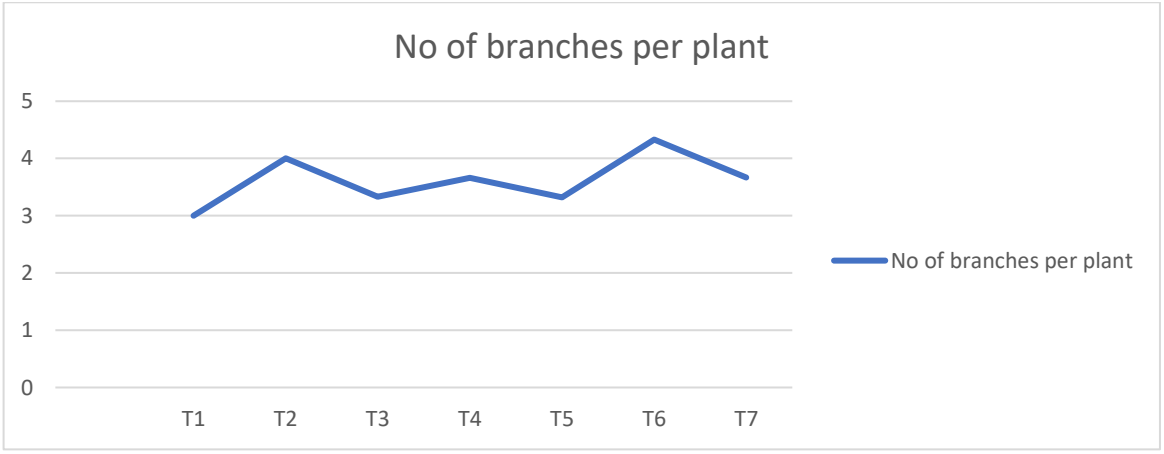
the maximum data recorded in seed yield per plant with treatment T_6 (75% RDF + vermicompost + *Rhizobium*) (1224.67 g) followed by treatment T_2 (75% RDF + Vermicompost) (1088.00 g). The lowest seed / grain yield was recorded at T_1 (control (100%)) (931.00). Information on seed yield as impacted by different treatments has shown that the yield of chickpea seeds has increased significantly by injecting Rhizobium and vermicompost with the recommended amount of fertilizer. Rhizobium injection with vermicompost improves phosphorus availability and the presence of phosphorus increases the number of fertile seeds. Similar results are also reported by **Gupta *et al.*, (2006).**

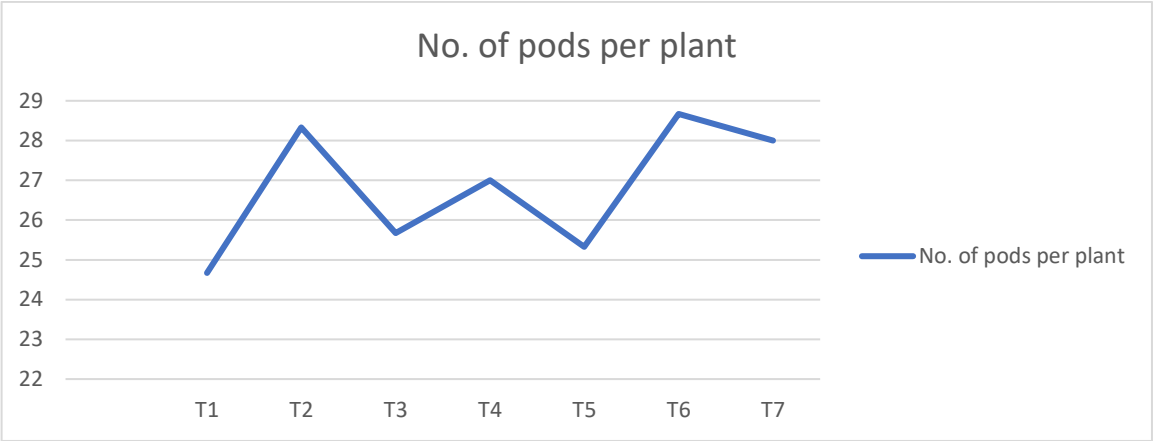
Table. 1 Shown Plant Height, Branches per Plant, Pods per Plant, Seeds per Plant and Seed yield per Plot (g)

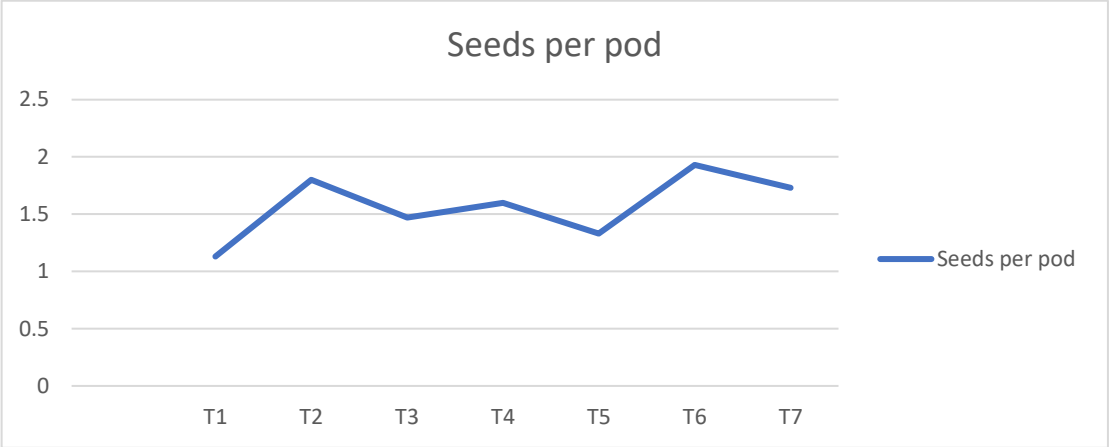
TREATMENT NO	TREATMENT	Height	Branches/plant	Pods per Plant	Seeds per Pod	Seed yield per Plot (g)
T_1	Control (100%) RDF	45.30	3.00	24.67	1.13	931.00
T_2	75% RDF + Vermicompost	48.48	4.00	28.33	1.80	1088.00
T_3	50% RDF + Vermicompost	45.81	3.33	25.67	1.47	1015.33
T_4	75% RDF + Rhizobium	46.72	3.66	27.00	1.60	1057.00
T_5	50% RDF + Rhizobium	47.41	3.32	25.33	1.33	953.00
T_6	75% RDF + Vermicompost + Rhizobium	48.83	4.33	28.67	1.93	1224.67
T_7	50% RDF + Vermicompost + Rhizobium	47.60	3.67	28.00	1.73	1079.00
	SEm±	**0.75**	**0.206**	**1.418**	**0.0126**	**10.989**
	CD (5 %)	**2.25**	**0.617**	**4.251**	**0.346**	**10.215**

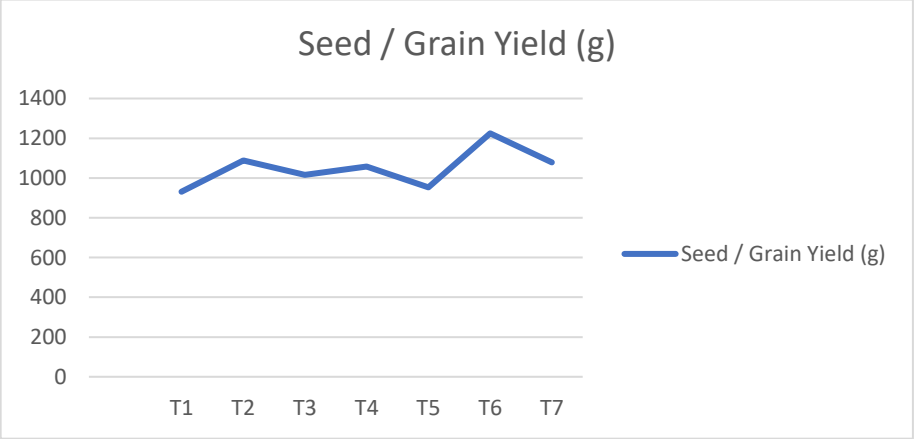
Graphs:











ACKNOWLEDGMENT:

This research is supported by Division of Research & Innovation, Uttaranchal University, Dehradun, India.

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