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Sunil kumar
Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Arun Alfred David
Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Correspondence
Sunil kumar
Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

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To Study the effect on organic manure and Bio-fertilizer on the protein content of the Mungbean

Sunil Kumar and Arun Alfred David

Abstract
A study was conducted during kharif season 2019-20 to study the "To study the effect on organic manure and bio-fertilizer on the protein content of the mungbean var. Samrat" on crop research farm department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute, SHUATS, Allahabad. The design applied for statistical analysis was carried out with 3x2x2 factorial randomized block design having three factors with two level of Neem cake @0,100%, Rhizobium @ 0, 100% and VAM @ 0,100% respectively. The best treatment was T_8 - NC_2B_2 (100% Neem cake and Rhizobium) that showed the significant increase in protein content of the Greengram. The minimum protein content was recorded 21.2 in T_0 - NC_0B_0 (0% neemcake, 0% Rhizobium, 0% VAM). On the basis of the experiment it can be concluded that organic manure and bio-fertilizer increases nutrient content in the mungbean.

Keywords: Protein, neemcake, rhizobium, VAM, Mungbean

Introduction
India is the world's largest producer of pulses where pulses are the second main source of protein after cereals in Indian diet (Narayan and Kumar, 2015) [10]. Pulses are the main source of protein particularly for vegetarians and contribute about 14% of the total protein of average Indian diet. Every 100 g of edible portion of greengram seed contains 75 mg calcium, 4.5 mg phosphorus, 24.5 g protein and 348 kilo calories of energy. Green gram is an excellent source of protein (24.5%) with high quality of lysine (460mg/g N) and tryptophan (60mg/g N). It contains also remarkable quantity of ascorbic acid and riboflavin (0.21mg /100g) and minerals (3.84g/100g). Production of pulses in the county is far below the requirement to meet even the minimum level per capita consumption. The per capita availability of pulses in India has been continuously decreasing which is 32.52 g day^{-1} against the minimum requirement of 80 g day^{-1} per capita prescribed by Indian Council of Medical Research (ICMR) (Anonymou s, 2006**).** In India, Greengram covers 34.00 lakh ha area and contributes 23.70 lakh tonnes in pulse production in the country (DAC, 2018-19, Singh *et al*. 2017a; Singh *et al*. 2017b; Singh *et al*. 2017c; Singh *et al*. 2018; Tiwari *et al*. 2018; Tiwari *et al*. 2019a; Tiwari *et al*. 2019b; Kour *et al*. 2019; Singh *et al*. 2019). It is rich source of amino acids like Leucine, Phenylalanine, Lysine, Valine, Isoleucine and deficient in methionine and chief and important source of protein for country like India where most of the people are vegeterians. It is a cheap source of protein for those who cannot afford to use animal protein content in the form of milk, meat and eggs (Malik BA 1994) [8].Thus, the objective of this study was to investigate the effect on organic manure and bio-fertilizer on the protein content of the mungbean.

Neem Cake
Neemcake is a byproduct of neemoil producing units which is used as organic manure and insecticide in the agriculture from many decades. Neemcake contains a generous amount of macro & micronutrients and trace elements to address any plant nutrient deficiencies and provides a rich source of vegetable proteins and carbs for soil microbes. This in turn leads to higher nutrient assimilation for the plant.
The composition of Neem cake is 5.2% N, 1.0% P, 1.4% K. Neem cake act as a nitrogen

inhibitor means reduce the nitrification. It supplies the available nitrogen for a long time in the soil (Katyayan, 2012) [5].

Rhizobium

Rhizobium is a genus of Gram-negative soil bacteria that fix nitrogen. Rhizobium species form an endosymbiotic nitrogen-fixing association with roots of legumes. The bacteria colonize plant cells within root nodules, Rhizobium will fix atmospheric nitrogen by living symbiotically to the soil (Bhavya *et al*., 2018) [3]. The plant, in turn, provides the bacteria with organic compounds made by photosynthesis. This mutually beneficial relationship is true of all of the rhizobia, of which the genus Rhizobium is a typical example.

The largest contribution of biological nitrogen fixation to agriculture is derived from the symbiosis between legumes and *Rhizobium* species (Meena *et al.*, 2016) [9].

VAM

VAM stands for Vesicular-arbuscular mycorrhizal fungi. These are fungi that grow directly into plant roots—and far from causing disease, they take some nutrients form the plants but also transfer nutrients, especially minerals, directly to the plants. They either form bubble-like vesicles inside the plant roots, or branching structures called arbuscules (Akhtar *et al* 2014) [2].

Materials and Methods

The investigation on "To study the effect on organic manure and bio-fertilizer on the protein content of the mungbean" A field experiment was carried out at soil science research farm of department of Soil Science and Agricultural Chemistry SHUATS Prayagraj, (U.P.) India during kharif season 2019-2020. The soil of experimental area falls in order Inceptisol and the experimental field is Alluvial in nature. The design applied for statistical analysis was carried out with 3x2x2 factorial randomized block design having three factors with two levels of Neem cake @ 0 and 100%ha^{-1} and two level of Rhizobium @ 0 and 100% ha^{-1} and two levels of VAM @0 and 100% respectively(Table 1).

Experimental site

The experiment was carried out at research Farm of Soil Science at Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj the area is situated on the south of Prayagraj on the right side of the river Yamuna on the South of Rewa Road at a distance of about 6.5 Km from Prayagraj city. It is situated at 25^{0}24$'$23$''$N latitude, 81^{0}50$'$38$''$E longitude and at the altitude of 98 meter above the sea level.

Climate condition in the experimental area

The area of Prayagraj district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46^{0}C – 48^{0}C and seldom falls as low as 4 ºC – 5 ºC. The relative humidity ranged between 20 to 94 percent. The average rainfall in this area is around 1100 mm annually.

The source of organic manure is neemcake and Bio-fertilizer are rhizobium and VAM. No chemical fertilizer was used during this experiment for supplying plant nutrients like N,P,K was relied only on the Organic manure and Bio-fertilizer only. Neemcake was applied prior to the sowing on seed for its proper decomposition to avoid contact between the seed and neemcake. Rhizobium and VAM seed inoculation was done a day before seed sowing.

Extraction and estimation of protein content

500 mg of the sample was powdered with 5 to 10 mL of buffer, centrifuged and the supernatant was used for protein estimation (Lowry, 1951) [7].

0.2 to 1 mL of working standard and 1 mL of diluted mung bean extract (Test) were poured in a series of test tubes and the volume was made upto 4 mL with distilled water. The aliquots wereincubated with 5.5 mL of alkaline copper sulphate reagent in a water bath for 10 min. Then, 0.5 mL of Folin's reagent was added and incubated at room temperature for 30 min for change to blue colored product. The blank contained 4 mL of distilled water with 5.5 mL alkaline copper sulphate and 0.5 mL Folin's reagent. The optical density of solution was read at 650 nm.

Statistical Analysis

The data recorded on various parameters of crop during the course of investigation was statistically analyzed following the analysis of variance for split plot design as suggested by (Panse and Sukhatme 1985) [20]. Statistical significance was tested with 'F' value at 5 per cent level of probability and compared the treatment means with critical difference (CD).

Results and Discussion

Table 3 shows the interaction effects of Neemcake, Rhizobium and VAM are generally influenced protein content in greegram.

Table 1: Treatment combination of green gram

S. No	Symbol used	Treatment Combination	Description
1.	T_0	NC_0B_0	control
2.	T_1	NC_0B_1	VAM inoculation
3.	T_2	NC_0B_2	rhizobium
4.	T_3	NC_1B_0	neemcake@250kgha-
5.	T_4	NC_1B_1	neemcake@250kgha- +VAM
6.	T_5	NC_1B_2	neemcake@250kgha-1 +rhizobium
7.	T_6	NC_2B_0	neemcake@500kgha -1
8.	T_7	NC_2B_1	neemcake@500kgha-1 +VAM
9.	T_8	NC_2B_2	neemcake@500kgha1 +rhizobium

Table 2: Protein content in mungbean seeds

S.No	Protein content%
1.T_0	21.20
2.T_1	21.60
3.T_2	21.77
4.T_3	22.10
5.T_4	22.07
6.T_5	22.84
7.T_6	22.93
8.T_7	23.60
9.T_8	25.33
SEm+	0.05792
CD (P=0.05)	0.416569

The interaction effects of Neem cake, Rhizobium and VAM inoculation on protein content of the greengram was significant. The maximum protein content was recorded 25.33%.in $T_8(NC_2B_2)$ @ neemcake@500kgha-1+rhizobium @100% ha^{-1} and minimum protein content was recorded was 21.2 in T_0 (NC_0B_0) @ 0% Neem cake @ ha-1 + @0% *Rhizobium* ha-1 + @ 0%VAM inoculation.it was concluded

from the results that combination of neemcake @500 kg ha-1+ rhizobium inoculation can be used to increase the protein ontent of the mungbean. Mung beans contain higher amounts of protein with globulin and albumin as main storage proteins in the seeds (Kirchhoff, 2002) [6].

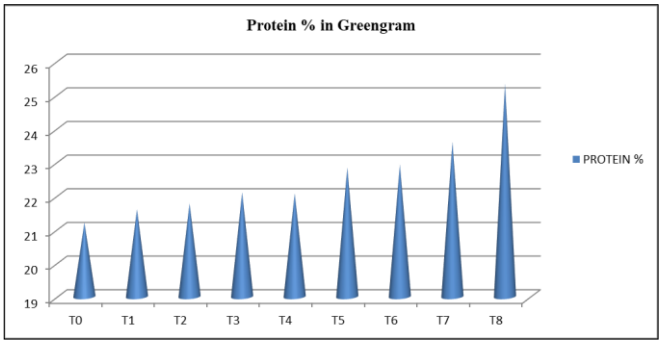

Fig 1: To study the effect on organic manure and bio-fertilizer on the protein content of the mungbean

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