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Quality and nutrient uptake as influenced by diverse nitrogen management in Vertisols

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Abstract
A field experiment entitled "Studies on nitrogen source diversification in Vertisols and its effect on soybean productivity" was conducted during the year 2017-18 at the Research Farm of Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The experiment was laid out in randomized block design with three replications. The treatments were comprised of seven nutrient management practices *viz*., RDF (30:75:30 NPK kg ha^{-1}) and in remaining six treatments, 50% RDN was given through urea and 50% RDN through different organic sources *viz*. Vermicompost, FYM + Jivamrut, FYM, Compost, soybean crop residues + *Trichoderma viride* and Glyricidia leaf incorporation. The protein and oil yield, significantly improved with application of RDF through chemical fertilizers. Significantly highest uptake of nitrogen (134.36 kgha^{-1}), phosphorus (22.10 kg ha^{-1}) and potassium (92.28 kg ha^{-1}) was recorded with treatment RDF alone, which was statistically at par with treatment of application of 50% RDN + 50% RDN through Vermicomposting (130.46, 21.23, 88.01 NPK kg ha^{-1} respectively).

Keywords: Nitrogen source diversification, Vertisols, soybean, quality, nutrient uptake

1. Introduction
Soybean (*Glycine max*. L.) is one of the important oilseed as well as leguminous crop. Soybean as a miracle "Golden bean" of the 21st century mainly due to its high protein (40%) and oil (20%) content. In India it is mainly grown as 'oilseed crop'. Due to its high nutritive value, soybean cultivation has taken great strides during recent years. It contains more essential amino acid and lysine (6.4%) which is limiting factor in cereals. In addition, soybean is the cheapest source of vegetable protein equivalent to meat, milk product and egg protein. Soybean is unique crop in nutritional value because it contains complete protein, carbohydrates, fats, vitamins and folic acid as well as minerals including calcium and iron required for good nutrition.

Soybean is also called as 'Gold of soil' for its various qualities such as ease in cultivation, less requirement of fertilizer and labour etc. It builds up the soil fertility by fixing atmospheric nitrogen through nodules. Symbiotically soybean fixes 125-150 kg N ha-1 and leaves behind at about 30-40 kg N ha-1 for succeeding crop. All these qualities have made it an ideal alternative for crop rotation. Balanced supply of nitrogenous fertilizers not only enhances nodulation but also increases crop yield and nutrient status of the soil.

It is obvious that intensive agriculture with very high nutrient turnover in soil-plant system coupled with low and imbalanced fertilizer use results in deterioration of native soil fertility and possesses serious threat to long term sustainability of crop production. Even though so called balanced use of chemical fertilizer will not be able to sustain high productivity, due to emergence of the deficiency of one or more secondary and micro- nutrient. High cost of chemical fertilizers, average farmers face problems to cultivate their land to desired level. In order to reduce the rate of fertilizer application, crop residue is the best option available today, even with the marginal farmers.

2. Materials and Methods
The soil of the experimental plot was very fine, clayey in texture dominated by smectite clay minerals which belongs to hyperthermic family of Typic Haplustert having swell shrink property. It was slightly alkaline in reaction, medium in organic carbon content, low in nitrogen and phosphate content while very high in exchangeable potassium.

The experiment was laid out in randomized block design with four replications. The treatments were comprised of five nutrient management practices *viz*., T1: RDF Alone, T2: 50% RDN + 50% RDN through Vermicompost, T3: 50% RDN + 50% RDN through FYM + Jivamrut @500 lit/ha., T4: 50% RDN + 50% RDN through FYM, T5: 50% RDN + 50% RDN through Compost, T6: 50% RDN + 50% RDN through soybean crop residue + *Trichoderma viride* @ 1kg/ha and T7: 50% RDN + 50% RDN through Glyricidia leaf incorporation.

3. Tables, Figures and Equations

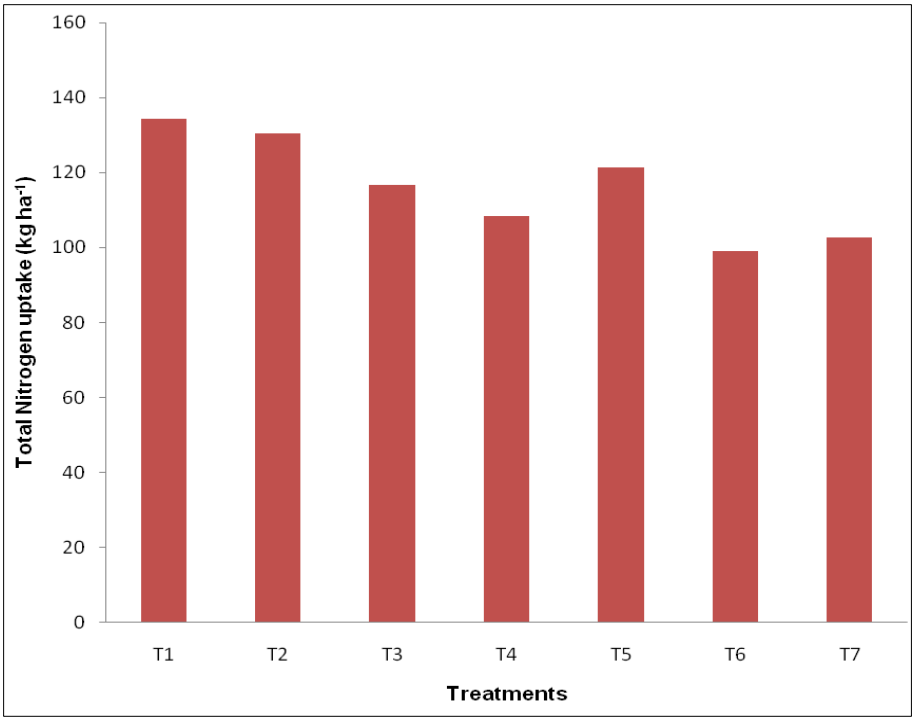

Fig 1: Total Nitrogen uptake (kg ha-1) by soybean as influenced by various treatments

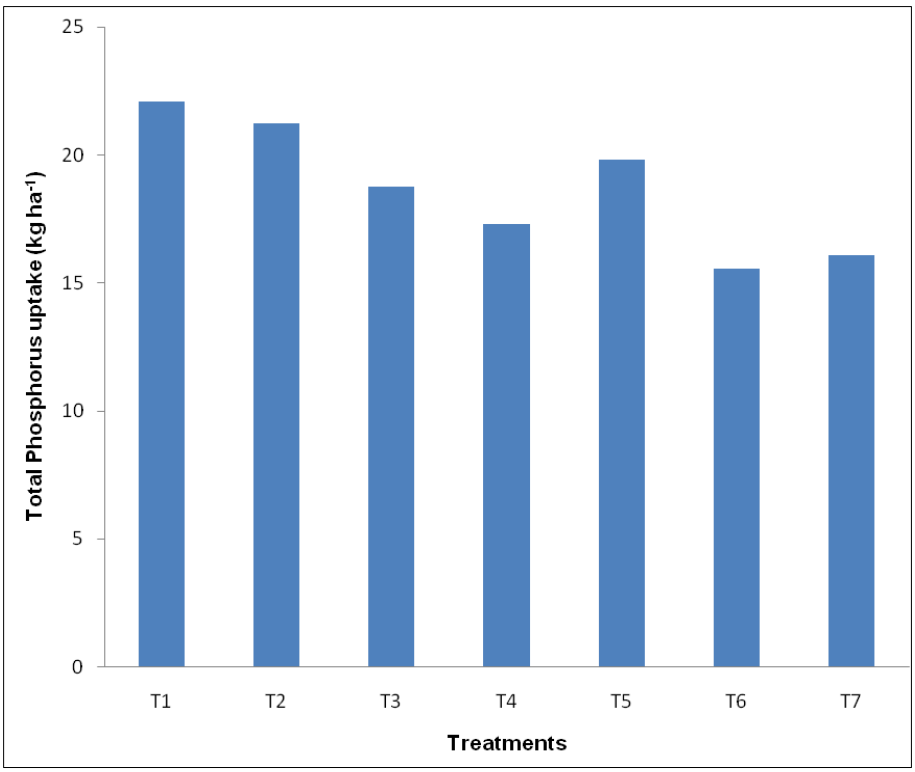

Fig 2: Total Phosphorus uptake (kg ha-1) by soybean as influenced by various treatments

Significantly highest N, P, K uptake was recorded with treatment RDF alone. However, this treatment was found statistically at par with treatment of 50% RDN + 50% RDN through vermicompost with respective value of 130.46 kg ha-1 as depicted in Fig.1.2 and 3.

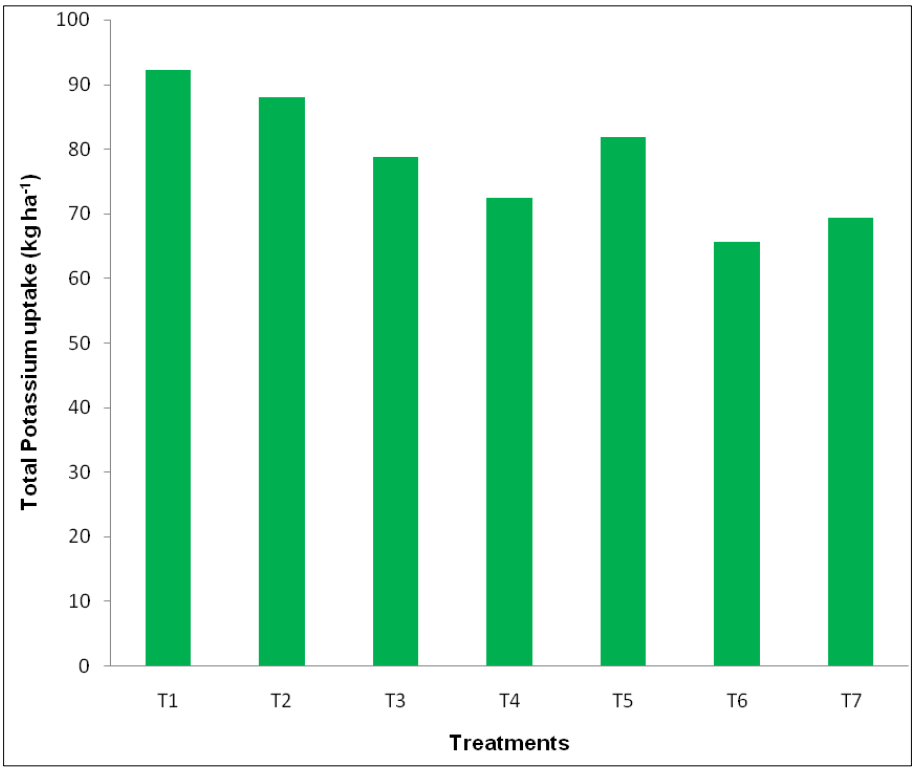

Fig 3: Total Potassium uptake (kg ha^{-1}) by soybean as influenced by various treatments

Table 1: Oil and Protein content as influenced by various treatments

Treatment	Oil content (%)	Protein content (%)
T1	19.18	36.50
T2	19.11	36.31
T3	19.04	36.13
T4	18.78	36.00
T5	19.06	36.25
T6	18.25	35.50
T7	18.37	35.94
S.E(m)±	0.50	2.92
CD	NS	NS
GM	18.83	36.09

It was concluded from the above table that oil and protein content was significantly improved with the application of RDF alone which was found statistically at par with 50%RDN + 50% RDN through vermicompost.

4. Conclusions

Protein and oil yield as well as highest N,P,K uptake was significantly improved with treatment RDF alone chemical fertilizers and being statistically comparable with treatment of 50% RDN + 50% RDN through Vermicompost.

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